SOIL SURVEY

Dickens County Texas

≡ OUR SOIL ★ OUR STRENGTH ≡

Issued February 1970

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TEXAS AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1961–65. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Duck Creek and the King Stonewall Soil and Water Conservation Districts.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased, on individual order, from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in determining the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

All of the soils of Dickens County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with a number shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the dryland capability unit, irrigated capability unit, and range site.

Other classifications can be developed by using the map and information in the text to group soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and ranchers and those who work with them can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units, both dryland and irrigated, and the range sites.

Ranchers and others interested in range can find, under "Range Management," groupings of the soils according to their suitability for range and a description of the vegetation on each range site.

Sportsmen and others can find brief information in the section "Wildlife."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that give test data, estimates of soil properties, and information about soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Dickens County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

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SOIL SURVEY OF DICKENS COUNTY, TEXAS

BY CHARLES L. GIRDNER, JR., AND WAYNE E. RICHARDSON, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

DICKENS COUNTY is in the northwestern part of Texas (fig. 1). It has a total area of 595,200 acres, or 930 square miles. Dickens is the county seat.

This county is partly in the High Plains section and partly in the Rolling Plains section of the Southern Great Plains. About 32,000 acres in the northwestern quarter of the county is a part of the High Plains. The soils in this part are mostly nearly level and are cultivated. Playas dot the area. The soils on the Rolling Plains are mostly gently sloping to moderately sloping. They are used both as range and as cropland.

Farming is of foremost importance. Cotton is the main cash crop. About 187,000 acres of the county is cultivated; of this, slightly more than 13,000 acres is used for irrigated farming, and the rest is used for dryland farming. Just as in other counties in the western part of Texas, Dickens County has periods of drought and only occasional years of adequate rainfall. During the dry years satisfactory yields are obtained only from the best dryland soils and from irrigated soils. Both water erosion and soil blowing are hazards in most areas.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Dickens County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the rock material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this soil survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Abilene and Miles, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in the texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Miles fine sandy loam and Miles loamy fine sand are two soil types in the Miles series. The difference in the texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into

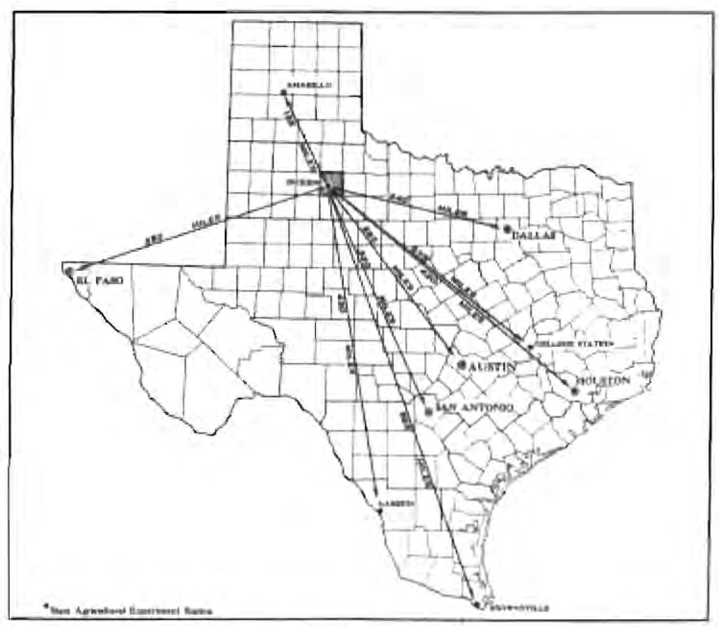

Figure 1.—Location of Dickens County in Texas.

phases. The name of a soil phase indicates a feature that affects management. For example, Miles fine sandy loam, 1 to 3 percent slopes, is one of four phases of Miles fine sandy loam, a soil type that has a slope range of 0 to 8 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized type or phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed or occur in such small individual tracts that it is not practical to show them separately on the map. They show such a mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Quinlan-Cottonwood complex. Another kind of mapping unit is the soil association. It is a large acreage that consists of two or more soils and is uniform in pattern and proportion of the dominant soils, though these soils may differ greatly. An example is Berda-Potter association, 3 to 30 percent slopes.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the soil map like other mapping units, but they are given descriptive names, such as Rock outcrop and Rough broken land, and are called land types.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for selected soils.

Only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of readers, among them farmers, ranchers, managers of rangeland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil surveys. On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. The groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Dickens County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The seven soil associations in this county are each described in the following pages. The terms for texture used in the title for several of the associations apply to the surface layer. For example, in the title for association 1, the word "loamy" refers to texture of the surface layer.

1. Woodward-Quinlan-Cottonwood association

Moderately deep to very shallow, loamy soils of the breaks

This association of loamy soils is mainly in the southeastern part of the county. It includes the area known locally as the Croton Breaks, a rough, rolling and sloping area dissected by deeply cut drainageways that have steep sides (fig. 2). These drainageways empty periodic runoff into Croton Creek. This association makes up about 33 percent of the county.

Woodward soils make up about 20 percent of this association. They have a surface layer of reddish-brown loam and a subsoil of friable, red loam. Quinlan soils, which make up about 20 percent, are shallow, red very fine sandy loams underlain by sandstone. Both Woodward and Quinlan soils are in the smoother, rolling parts of the association. Cottonwood soils, which make up 15 percent of the association, are in the rougher parts. These are very shallow soils underlain by gypsum.

The rest of this association consists of small areas of Carey, Enterprise, Olton, Vernon, and Yahola soils and areas of Rough broken land and Breaks-Alluvial land complex.

More than 95 percent of this association occurs within a few large ranches and is used as range. Water erosion is a hazard because of the steep slopes.

2. Olton-Weymouth-Abilene association

Nearly level to moderately sloping, chiefly deep, loamy soils

This association of loamy soils is mainly in the south-central part of the county, where the topography con-

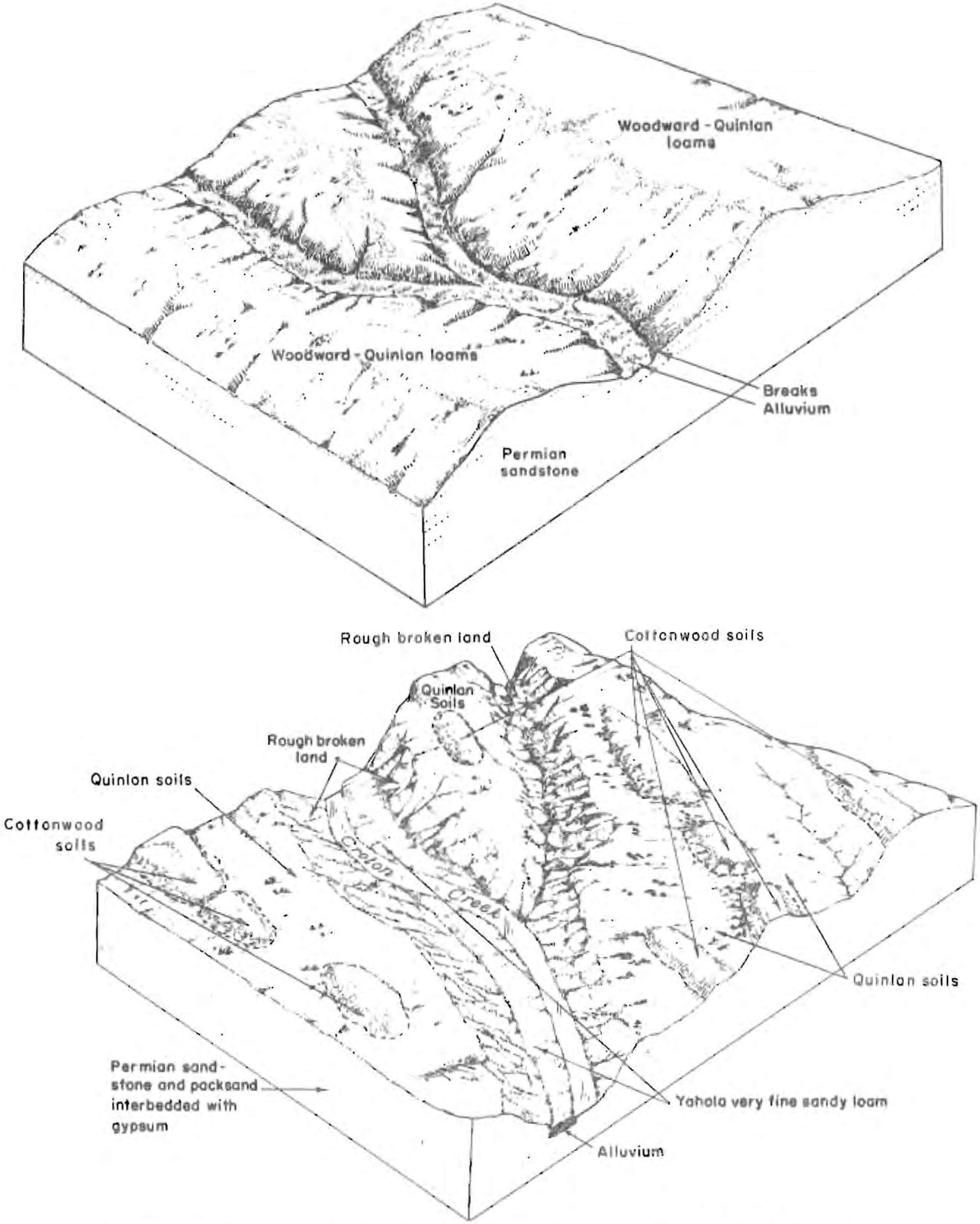

Figure 2.—Top, typical area of association 1; *bottom,* a rough, broken, and steep part of association 1.

sists of low, gently rolling ridges and knolls dissected by scattered creeks or drainageways (fig. 3). This association makes up about 18 percent of the county.

Olton soils, which make up about 50 percent of this association, have a surface layer of reddish-brown clay loam and a compact subsoil of blocky heavy clay loam. Weymouth soils, which make up 15 percent, have a limy surface layer of reddish-brown clay loam and a subsoil of friable, subangular blocky clay loam. A caliche layer is near the surface. Abilene soils make up about 10 percent of the association. They have a surface layer of grayish-brown clay loam and a subsoil of dark-brown to dark grayish-brown, blocky light clay.

The rest of this association consists of areas of Miles, Spur, Vernon, and Woodward soils.

About half of this association is cultivated. Cotton, sorghum, and small grain are the main crops. The soils are fertile and easy to till. Low rainfall and droughtiness are the main limitations. Water erosion and soil blowing are slight to moderate hazards.

3. *Miles association*

Nearly level to sloping, deep, loamy and sandy soils

This association of loamy and sandy soils occurs on rolling plains cut by scattered drainageways and creeks. It makes up about 18 percent of the county.

Miles soils make up about 75 percent of this association. They have a surface layer of brown to reddish-brown fine sandy loam or loamy fine sand and a subsoil of reddish-brown sandy clay loam.

The rest of this association consists of Brownfield, Mansker, Meno, and other minor soils.

Most of the association is cultivated. Cotton, soybeans, and small grain are the main crops. Water erosion and soil blowing are moderate to severe hazards.

4. *Brownfield-Nobscot association*

Undulating, deep, sandy soils

This association of sandy soils occurs mainly in the northeastern part of the county. It makes up about 12 percent of the county.

Brownfield soils make up about 50 percent of this association. They have a surface layer of brown to very pale brown fine sand and a subsoil of reddish-brown sandy clay loam. Nobscot soils make up 25 percent. They have a surface layer similar to that of Brownfield soils but have a subsoil of reddish-yellow light fine sandy loam.

The rest of this association consists of small areas of Miles, Olton, and Weymouth soils.

Most of this association is used as range. A few areas were once cultivated but have been abandoned because of soil blowing. The soils are low in available plant nutrients and in available moisture capacity.
clayey soils

5. *Rough broken land-Berda-Mansker association*

Rough lands and moderately sloping to steep soils below the caprock

This association forms a band, one-half mile to 5 miles wide, in the northwestern part of the county. It is below and roughly parallel to the caprock escarpment. The topography consists of numerous hills, slopes, and vall and the pattern of soils is complex (fig. 4). This associa makes up about 8 percent of the county.

Rough broken land makes up about 33 percent of association. Berda soils, which make up about 23 cent, have a surface layer of grayish-brown loam ar subsoil of pale-brown loam. Mansker soils, which n up 14 percent, have a surface layer of grayish-brow brown fine sandy loam or loam and a subsoil of p brown loam to clay loam. Mansker soils are shallo than Berda soils and are higher in lime content.

The rest of this association consists of Potter soils less extensive areas of Bippus, Mobeetie, Miles, Sp and Vernon soils.

Most of this association is used as range consisting short, mid, and tall grasses.

6. *Pullman association*

Nearly level to gently sloping, deep, loamy soils

This association is in the northwestern part of county. The surface is smooth except for scattered pressions, which collect runoff. (See fig. 4.) This assoc tion makes up about 6 percent of the county.

Pullman soils make up about 80 percent of this assoc tion. They have a surface layer of dark grayish-bro clay loam and a subsoil of dense clay.

The rest of this association consists mainly of Loft Mansker, and Randall soils, all of which are in or n playa basins.

Most of this association is cultivated. The main cr are cotton, grain sorghum, and wheat. Small fields cotton are irrigated. Inadequate rainfall or poo distributed rainfall is the main limitation in dryla farming.

7. *Vernon-Olton-Miles association*

Gently sloping to sloping, shallow to deep, loamy a clayey soils

This association of loamy and clayey soils is most in the southwestern part of the county. The topograp consists of ridges and knolls. This association makes about 5 percent of the county.

Vernon soils make up about 40 percent of this associ tion. They have a surface layer of reddish-brown cl loam or clay and a compact subsoil of red clay. Olt soils, which make up about 15 percent, have a surfa layer of reddish-brown clay loam and a firm subsoil reddish-brown to red heavy clay loam. Miles soils al make up 15 percent. Their surface layer is reddish-brow fine sandy loam, and their subsoil is crumbly san clay loam. Olton and Miles soils have smoother reli than Vernon soils.

The rest of this association consists of areas of ba lands and of Latom, Stamford, Tillman, and Weymout soils.

Most of this association is used as range. A few area mainly of Olton and Miles soils, are cultivated. Verno soils are too shallow and too droughty for cultivate crops and, in addition, are susceptible to water erosio

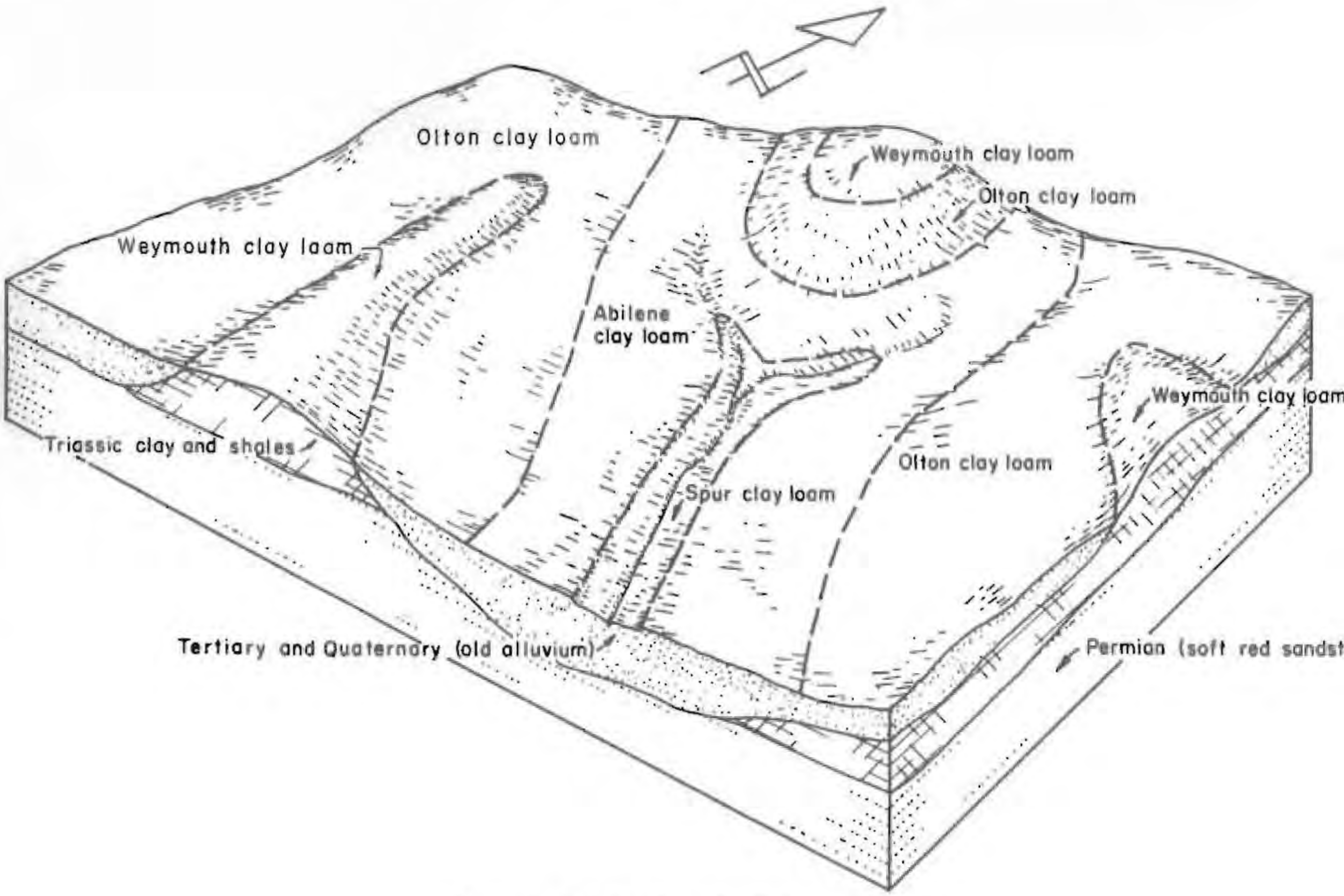

Figure 3.—Relationships of soils in association 2.

Descriptions of the Soils

This section describes each of the soil series and the mapping units in Dickens County, Texas. The procedure is to describe first a soil series and then the mapping units in that series. Thus, to get full information on any given mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs.

The soil series contains a description of the soil profile, that is, the major layers of the soil from the surface downward. This profile is considered typical, or representative, for all the soils of the series. If the profile for a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless they are apparent from the name of the mapping unit.

Some mapping units, for example, Breaks-Alluvial land complex and Rough broken land, are land types and do not belong to a soil series. Nevertheless, they are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is the symbol that identifies the soil or land type on the detailed map at the back of the survey. Shown at the end of each description are the capability classification and the range site group in which the mapping unit has been placed. The page on which each mapping unit, capability unit, and range site is described is listed in the "Guide to Mapping Units." The approximate acreage and proportionate extent of each mapping unit are given in table 1.

Abilene Series

The Abilene series consists of deep, nearly level and slightly concave, slowly permeable soils on smooth uplands, mostly in the southern half of the county. These soils developed from medium-textured to moderately fine textured sediments. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Abilene soil is about 7 inches of dark grayish-brown, friable clay loam. The subsoil, which extends to a depth of 38 inches, is dark-brown to dark grayish-brown heavy clay loam to light clay. It is firm below a depth of 13 inches and calcareous below a depth of 28 inches. The material beneath the subsoil consists of light-gray clay loam over old alluvial sediments.

Typical profile of Abilene clay loam, 0 to 1 percent slopes (fig. 5), in a cultivated field 250 feet south of a county road and 0.3 mile east of the intersection of Farm

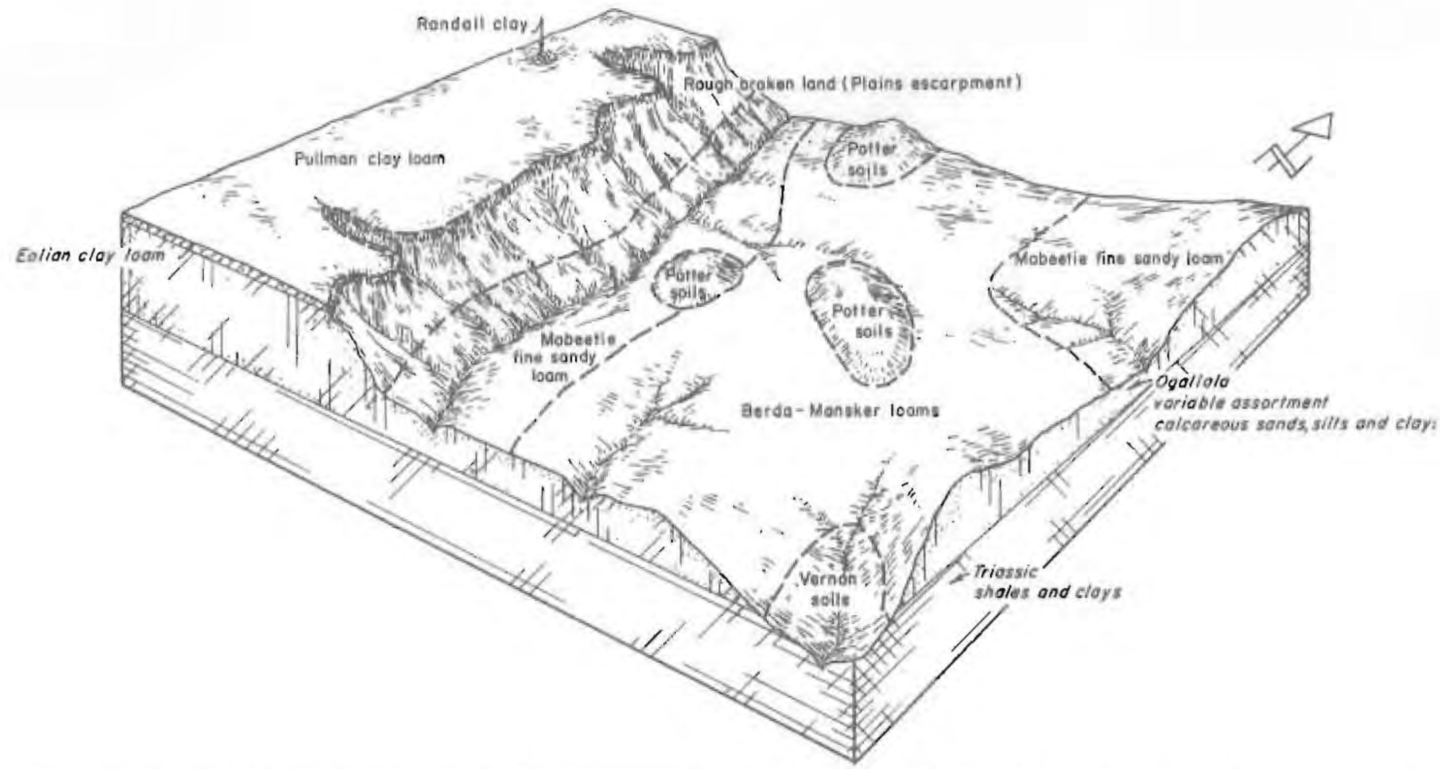

Figure 4.—On the right, starting at the edge of the escarpment, an area of association 5, and on the left, above the escarpment, an area of association 6.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Abilene clay loam, 0 to 1 percent slopes	16, 828	2. 8
Berda-Mansker complex, 3 to 8 percent slopes	4, 461	. 7
Berda-Potter association, 3 to 30 percent slopes	24, 421	4. 1
Bippus clay loam, 1 to 3 percent slopes	1, 531	. 3
Breaks-Alluvial land complex	7, 104	1. 2
Brownfield-Nobscot association, undulating	54, 407	9. 1
Carey loam, 1 to 3 percent slopes	3, 652	. 6
Carey loam, 3 to 5 percent slopes	3, 410	. 6
Colorado soils	4, 473	. 7
Cottonwood soils, 1 to 3 percent slopes	2, 273	. 4
Enterprise very fine sandy loam, 1 to 3 percent slopes	250	(1)
Enterprise very fine sandy loam, 3 to 5 percent slopes	356	. 1
Latom gravelly soils, 3 to 8 percent slopes	3, 250	. 5
Lincoln soils	3, 998	. 7
Lincoln loamy fine sand, loamy substratum variant	989	. 2
Lofton clay loam	1, 635	. 3
Mangum soils	1, 100	. 2
Mansker loam, 1 to 3 percent slopes	2, 821	. 5
Mansker loam, 3 to 5 percent slopes	1, 010	. 2
Meno fine sandy loam	2, 062	. 3
Meno loamy fine sand	3, 821	. 6
Miles fine sandy loam, 0 to 1 percent slopes	10, 419	1. 8
Miles fine sandy loam, 1 to 3 percent slopes	51, 581	8. 7
Miles fine sandy loam, 3 to 5 percent slopes	41, 595	7. 0
Miles fine sandy loam, 5 to 8 percent slopes	1, 394	. 3
Miles loamy fine sand, 0 to 3 percent slopes	19, 811	3. 3
Miles loamy fine sand, 3 to 5 percent slopes	14, 882	2. 5
Miles soils, 2 to 6 percent slopes, eroded	1, 944	. 3
Mobeetie fine sandy loam, 1 to 3 percent slopes	2, 020	. 3
Mobeetie fine sandy loam, 3 to 5 percent slopes	4, 344	. 7
Olton clay loam, 0 to 1 percent slopes	17, 727	3. 0
Olton clay loam, 1 to 3 percent slopes	39, 469	6. 6
Portales loam, 0 to 1 percent slopes	1, 220	. 2
Pullman clay loam, 0 to 1 percent slopes	25, 915	4. 4
Pullman clay loam, 1 to 3 percent slopes	3, 426	. 6
Quinlan-Cottonwood complex	57, 445	9. 7
Randall clay	8, 264	1. 4
Randall fine sandy loam	368	. 1
Rock outcrop	707	. 1
Rough broken land	23, 793	4. 0
Spur clay loam	5, 542	. 9
Spur fine sandy loam	8, 949	1. 5
Stamford clay, 1 to 3 percent slopes	229	(1)
Tillman clay loam, 0 to 1 percent slopes	1, 055	. 2
Tillman clay loam, 1 to 3 percent slopes	2, 678	. 4
Veal fine sandy loam, 1 to 3 percent slopes	1, 069	. 2
Veal fine sandy loam, 3 to 5 percent slopes	7, 700	1. 3
Vernon soils, 3 to 8 percent slopes	9, 156	1. 6
Vernon-Badland complex, hilly	4, 612	. 7
Weymouth clay loam, 1 to 3 percent slopes	15, 748	2. 6
Weymouth clay loam, 3 to 5 percent slopes	5, 965	1. 0
Woodward loam, 1 to 3 percent slopes	4, 540	. 8
Woodward loam, 3 to 5 percent slopes	8, 289	1. 4
Woodward-Quinlan loams, 3 to 15 percent slopes	42, 224	7. 1
Yahola very fine sandy loam	3, 924	. 7
Creeks, pits, and other areas	3, 344	. 5
Total	595, 200	100. 0

[1] Less than 0.05 percent.

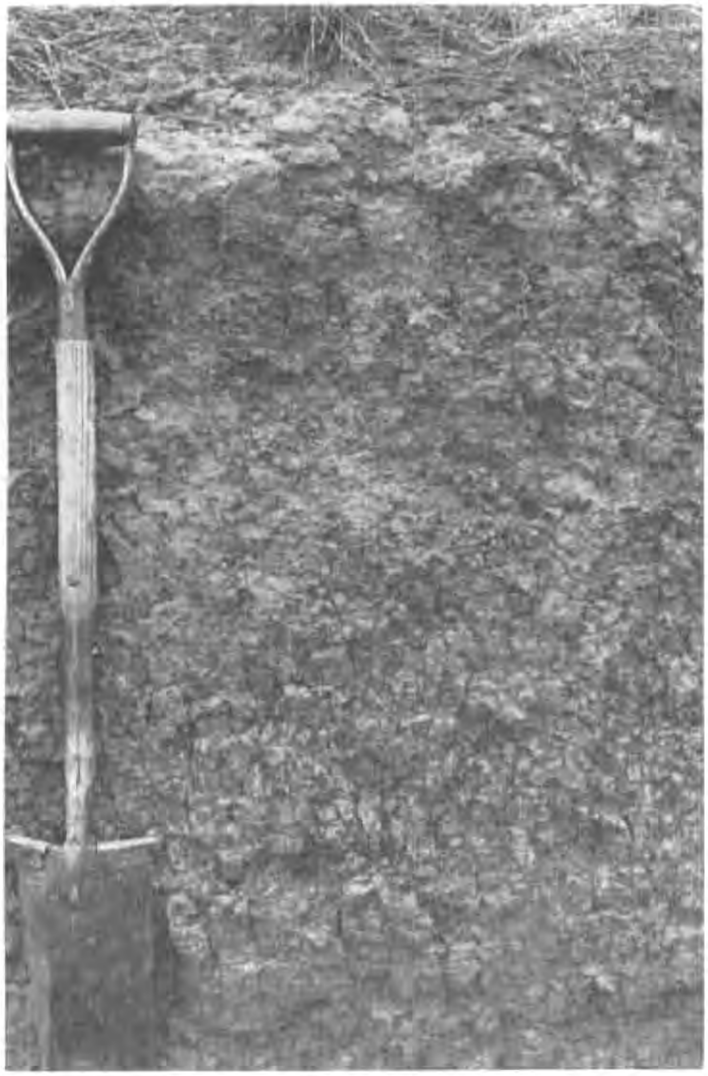

Figure 5.—**Profile of Abilene clay loam, 0 to 1 percent slopes, showing blocky structure in the subsoil.**

Road 1868 and Farm Road 1302, approximately 3 miles northwest of Spur.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak granular structure; hard when dry, friable when moist; noncalcareous and neutral; abrupt boundary.

B1—7 to 13 inches, dark-brown (10YR 4/3) heavy clay loam, very dark brown (10YR 3/3) when moist; compound, moderate, medium, subangular blocky and granular structure; hard when dry, friable when moist; about 5 percent fine pores and worm casts; noncalcareous and mildly alkaline; gradual boundary.

B21t—13 to 28 inches, dark grayish-brown (10YR 4/2) light clay, very dark grayish brown (10YR 3/2) when moist; moderate, medium, blocky structure; very hard when dry, firm when moist; distinct clay films; common fine pores; noncalcareous and mildly alkaline; gradual boundary.

B22t—28 to 38 inches, grayish-brown (10YR 5/2) light clay, dark grayish brown (10YR 4/2) when moist; moderate, medium, blocky structure; very hard when dry, firm when moist; distinct clay films; common fine pores; few films and threads of calcium carbonate on surface of peds; calcareous and moderately alkaline; gradual boundary.

C1ca—38 to 52 inches, light-gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) when moist; about 30 percent segregated soft masses and concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C2—52 to 64 inches +, light-gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) when moist; hard when dry, friable when moist; calcareous.

The solum ranges from 30 to 50 inches in thickness. The A horizon is 5 to 10 inches thick. When dry, it ranges from brown to dark grayish brown in hues of 7.5YR to 10YR. It is one value darker colored when moist. The B1 horizon has about the same color range as the A horizon. It ranges from clay loam to light clay in texture and from 5 to 10 inches in thickness. The B2t horizon ranges from 15 to 40 inches in thickness and from heavy clay loam to light clay in texture. When dry, it ranges from dark grayish brown to brown, and in a few places it is reddish brown. The hue ranges from 7.5YR to 10YR. The structural aggregates range from moderate to strong in distinctness, from fine to medium in size, and from subangular blocky to blocky in shape. In most places the B22t horizon is one value lighter colored than the B21t horizon. It is calcareous in most places. When dry, the C1ca horizon ranges from white to grayish brown in hues of 7.5YR to 10YR. The content of calcium carbonate ranges from 15 to 50 percent. This horizon contains gypsum in some places.

Abilene soils are more clayey than Miles and Meno soils and have a more blocky structure in the B2t horizon. Abilene soils are grayer than Olton and Tillman soils and typically are slightly deeper to the B2t horizon.

Abilene clay loam, 0 to 1 percent slopes (AbA).—This soil has the profile described as typical of the Abilene series. It occurs in broad areas and generally has a slope of 0.5 percent or less.

Included with this soil in mapping were areas of Miles, Olton, and Meno soils less than 5 acres in size. These soils are slightly redder and tend to have more sand in their subsurface layer. Also included were areas of Cottonwood and Spur soils along natural drainageways.

This Abilene soil is high in natural fertility, but a thin, hard crust forms on it after rains. It is more droughty than the sandy soils in the county. Light rains wet it less deeply, and heavy rains result in runoff. Thus, less moisture is available to plants. Most of the acreage is cultivated, mainly to cotton, sorghum, and wheat. The rest is in buffalograss, tobosagrass, vine-mesquite, and mesquite trees. (Dryland capability unit IIce-3; irrigated capability unit I-3; Deep Hardland range site)

Berda Series

The Berda series consists of gently sloping to moderately sloping, moderately permeable soils on alluvial fans and foot slopes below the High Plains escarpment. These soils developed in calcareous sediments. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Berda soil is about 10 inches of grayish-brown, friable, calcareous loam. The subsoil, which extends to a depth of 48 inches, is pale-brown, friable and crumbly, calcareous loam. The underlying material is about the same as the subsoil except that it is massive and not so porous or so crumbly.

Typical profile of a Berda loam in a pasture 50 feet west of a ranch road, at a point 1.2 miles northwest of intersection with a county road, 2 miles west of Elton.

A1—0 to 10 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) when moist; weak granular structure; slightly hard when dry, friable when moist; about 15 percent worm casts and 5 percent calcium carbonate concretions; calcareous and moderately alkaline; gradual boundary.

B2—10 to 22 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; weak granular structure; slightly hard when dry, friable when moist; about 15 percent worm casts and 10 percent fine to medium concretions and films, threads, and soft masses of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

B3—22 to 48 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; compound prismatic and weak granular structure; slightly hard when dry, friable when moist; about 5 percent worm casts and 10 percent fine to large concretions and soft masses of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C—48 to 60 inches +, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; massive; hard when dry, friable when moist; calcareous and moderately alkaline.

The A1 horizon ranges from loam to light clay loam in texture and from 8 to 14 inches in thickness. The structure is weak granular or weak subangular blocky in most places but is compound prismatic in some. When dry, this horizon ranges from brown to light brownish gray or light brown in hues of 7.5YR to 10YR, values of 4 to 6, and chromas of 2 to 4. The B2 horizon ranges from 10 to 25 inches in thickness. It generally is loam but is clay loam or sandy clay loam in some places. The structure ranges from weak to moderate, coarse, prismatic to fine to medium, subangular blocky and granular. When dry, this horizon ranges from brown to pinkish gray or very pale brown in hues of 7.5YR to 10YR, values of 5 to 7, and chromas of 2 to 4. The B3 horizon has about the same color as the B2 horizon, but in a few places the value is one unit higher. The texture of the B3 ranges from loam to sandy clay loam or clay loam.

Berda soils have a thicker solum than Mansker and Veal soils and a lighter colored surface layer than Bippus soils. Berda soils have a less sandy subsoil than Mobeetie soils.

Berda-Mansker complex, 3 to 8 percent slopes (BmD).—This complex occurs as irregularly shaped areas ranging from about 60 to more than 100 acres in size. It is on smooth, rolling terrain below the High Plains escarpment, in the northwestern part of the county. The slope is dominantly about 5 percent.

About 60 percent of this complex is Berda loam, 35 percent is Mansker loam, and 5 percent is Potter loam. Each delineation on the map contains both Berda and Mansker soils, but the percentage of each soil varies. The percentage of Berda soil ranges from 30 to 75, and that of Mansker soil from 20 to 60. The percentage of Potter soil ranges from 0 to 15.

The Berda soil in this complex has the profile described as typical of the Berda series. It occurs on the sides of ridges and knolls.

The Mansker soil occurs at the tops of the ridges and knolls. Typically, it has a surface layer of grayish-brown, friable, calcareous loam about 8 inches thick. The subsoil extends to a depth of 16 inches and is pale-brown, friable, crumbly, calcareous clay loam. It is underlain by whitish caliche sediments.

This complex is not suitable for cultivation. Erosion is a persistent hazard, and many areas are shallow to caliche. (Dryland capability unit VIe–5; Deep Hardland range site)

Berda-Potter association, 3 to 30 percent slopes (BpF).—This association occurs as irregularly shaped bands on rough terrain just below the High Plains escarpment. The slope averages about 8 percent. Small drainageways, 100 to 500 feet apart, carry water rapidly into creeks and drainageways.

About 37 percent of this complex is Berda loam, 31 percent is Mansker loam, 20 percent is Potter loam, and 12 percent is Rough broken land (fig. 6). The texture ranges from loam to fine sandy loam. In individual areas the percentage of Berda soil ranges from 15 to 40, and that of Potter soil also from 15 to 40. The percentage of Mansker soil ranges from 15 to 40, and that of Rough broken land from 5 to 20.

The Berda soil is on alluvial fans and foot slopes; the Potter soil is on the crests of ridges and knolls; and the Mansker soil is in convex areas between the Berda and Potter soils.

The Berda soil typically has a surface layer of grayish-brown, friable, calcareous loam about 9 inches thick. The subsoil, to a depth of 21 inches, is pale-brown, friable, porous, crumbly, calcareous sandy clay loam. Below a depth of 21 inches, the material is similar but is massive and is less porous and crumbly.

The Potter soil typically has a surface layer of grayish-brown, friable, calcareous loam that contains numerous caliche fragments and is about 6 inches thick. Beneath this layer is several feet of pinkish-white, weakly cemented caliche.

The surface layer of the Mansker soil typically is grayish-brown, friable, calcareous loam and is about 8 inches thick. It is underlain by about 7 inches of pale-brown, friable, crumbly, calcareous clay loam, and below this are whitish caliche sediments.

This association is not suitable for cultivation, because slopes are steep, gullies are numerous, and the hazard of erosion is persistent. It is better suited to grazing and wildlife. (Berda soil—dryland capability unit VIe–5, Deep Hardland range site; Potter soil—dryland capability unit VIIs–1, Very Shallow range site)

Bippus Series

The Bippus series consists of moderately permeable, mildly alkaline soils on concave fans and foot slopes. These soils are moderately deep to deep over caliche. They developed from medium-textured to moderately fine textured sediments. The vegetation under which they developed consisted of short grasses.

The surface layer of a Bippus soil in this county typically is about 16 inches of very dark grayish-brown, friable clay loam.[1] The subsoil, which extends to a depth of 28 inches, is brown, friable, calcareous clay loam. The underlying layer consists of light brownish-gray, calcareous clay loam.

Typical profile of Bippus clay loam, 1 to 3 percent slopes, in a pasture along a ranch trail 1 mile west of its

[1] The surface layer of typical Bippus soils is more than 16 inches thick, and therefore the correlation of Bippus soils in this county may be changed in future surveys.

Figure 6.—An area of Berda-Potter association, 3 to 30 percent slopes. In the background is a part of the High Plains escarpment.

intersection with the county road, which is 2 miles west of Elton.

A11—0 to 8 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, fine to medium, subangular blocky structure; very hard when dry, friable when moist; noncalcareous and mildly alkaline; gradual boundary.

A12—8 to 16 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; compound structure—moderate, fine to medium, subangular blocky and moderate, coarse, prismatic; very hard when dry, friable when moist; about 15 percent worm casts; noncalcareous and mildly alkaline; gradual boundary.

B2—16 to 28 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; compound structure—moderate, medium, subangular blocky and moderate, coarse, prismatic; very hard when dry, friable when moist; about 10 percent worm casts; calcareous and moderately alkaline; gradual boundary.

Cca—28 to 48 inches +, light brownish-gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist; calcareous and moderately alkaline.

When dry, the A11 horizon ranges from very dark grayish brown to dark grayish brown or dark brown in hues of 10YR to 7.5YR. When this layer is moist, the value generally is one unit lower. The structure is moderate, medium, subangular blocky in most places but ranges to moderate, medium, granular and, in some places, to compound, weak, prismatic. In some areas the A11 horizon is calcareous because of the deposition of limy material. The A12 horizon is similar to the A11 horizon, but in some places the color is one value higher and the prismatic structure is more evident. When dry, the B2 horizon ranges from dark grayish brown to brown and yellowish brown in hues of 10YR to 7.5YR. The value generally is 5 but in some places is 4. The chroma ranges from 2 to 4. The Cca horizon ranges from faint to distinct, and the color range is wide in hues of 7.5YR to 10YR. When dry, this horizon generally has a range of 5 to 7 in value and of 2 to 4 in chroma. The texture ranges from loam to clay loam.

Bippus soils have a darker colored surface layer than Berda and Veal soils. Bippus soils lack the calcareous surface layer common in Spur soils and are not stratified.

Bippus clay loam, 1 to 3 percent slopes (BuB).—This soil has the profile described as typical of the Bippus series. It occurs in the valleys, downslope from Berda and Mansker soils and upslope from Spur soils. The slope is mostly about 1.5 percent.

Included with this soil in mapping were areas that have a loam surface texture. These areas total about 10 percent of the acreage. Also included were small areas of Berda, Spur, and Miles soils.

This Bippus soil is moderately fertile. The hazard of water erosion is moderate, and the hazard of soil blowing is slight. Most areas are used as range and have a good cover of native grass. Some areas are cultivated, mainly to cotton, sorghum, and wheat. (Dryland capability unit IIIe-1; irrigated capability unit IIe-2; Deep Hardland range site)

Breaks-Alluvial land complex (Bv).—This land type occurs as long, narrow areas that are between 50 and nearly 500 acres in size. These areas are mainly in the eastern half of the county (fig. 7). The Breaks are along the sides of deeply cut, winding, intermittent drainageways. The dominant slope is nearly 40 percent. Alluvial land, which is nearly level to moderately sloping, is on the flood plains below the Breaks.

Breaks make up about 55 percent of this complex, and Alluvial land makes up 35 percent. The rest consists of Cottonwood, Quinlan, or Woodward soils. In individual areas the percentage of the Breaks is between 35 and 65, of Alluvial land between 20 and 55, and of Cottonwood, Quinlan, or Woodward soils between 0 and 15.

Where Breaks occur with Cottonwood soils, they have a rim or cap of gypsum (alabaster). Alluvial land consists of deep, reddish, loamy and stratified sediments. It is covered with vegetation.

This complex is not suitable for cultivation, because Breaks are steep and Alluvial land is subject to flooding and water erosion. Grazing and habitat for wildlife are better uses. (Breaks—dryland capability unit VIIs-2, Rough Breaks range site; Alluvial land—dryland capability unit Vw-2, Loamy Bottomland range site)

Brownfield Series

The Brownfield series consists of gently sloping to hummocky, deep, well-drained soils. These soils developed in sandy eolian sediments. The vegetation under which they developed consisted of tall grasses.

The surface layer of a typical Brownfield soil is about 25 inches of brown, slightly acid fine sand. The subsoil, which extends to a depth of 52 inches, is reddish-brown, friable, slightly acid sandy clay loam. The underlying layer is neutral, reddish-yellow fine sandy loam.

Typical profile of a Brownfield fine sand in a native pasture 300 feet north of Farm Road 193, which is 2.75 miles east of East Afton.

A1—0 to 7 inches, brown (10YR 5/3) fine sand, dark brown (10YR 4/3) when moist; single grain; loose when dry and when moist; slightly acid; clear boundary.

A2—7 to 25 inches, very pale brown (10YR 6/4) fine sand, light yellowish brown (10YR 6/4) when moist; single grain; loose when dry and when moist; slightly acid; gradual boundary.

B2t—25 to 52 inches, reddish-brown (5YR 4/4) sandy clay loam, yellowish red (5YR 3/4) when moist; moderate, very coarse, prismatic structure; very hard when dry, friable when moist; slightly acid; gradual boundary.

C—52 to 58 inches +, reddish-yellow (7.5YR 7/6) fine sandy loam, reddish yellow (7.5YR 6/6) when

Figure 7.—An area of Breaks-Alluvial land complex.

moist; loose when dry and when moist; noncalcareous and neutral, becoming sandier with depth.

The A horizon ranges from 20 to 40 inches in thickness and from neutral to slightly acid in reaction. When dry, the A1 horizon ranges from brown to yellowish red in hues of 7.5YR to 10YR, and the A2 horizon ranges from light reddish brown to reddish yellow, very pale brown, or brownish yellow in hues of 5YR to 10YR. The A2 horizon is 10 to 30 inches thick in some places but is absent in others. When dry, the B2t horizon ranges from reddish brown to yellowish red or red in hues of 2.5YR to 5YR. The texture is light to heavy sandy clay loam. The structure ranges from weak to moderate in distinctness and is fine subangular blocky in some places. A B3 horizon of yellowish-red fine sandy loam to sandy clay loam is present in a few places. The C horizon ranges from reddish yellow to yellowish red in color and from loam to fine sand in texture. In about 30 percent of the areas, Brownfield soils are underlain at a depth of 34 to 60 inches by a layer of reddish-brown sandy clay loam, apparently a buried B2t horizon.

Brownfield soils have a thicker and sandier surface layer than Miles soils. They have a more clayey subsoil than Nobscot soils.

Brownfield-Nobscot association, undulating (Bw).—This association occurs on hummocky plains. The slope is dominantly about 1 percent.

About 65 percent of the association is Brownfield fine sand, and 35 percent is Nobscot fine sand. Included in mapping were small areas of Miles loamy fine sand and a few sand dunes less than 6 feet high and 50 feet wide.

The Brownfield soil has the profile described as typical of the Brownfield series. The surface layer of the Nobscot soil typically is about 36 inches of brownish, slightly acid fine sand. The subsoil, which extends to a depth of 54 inches, is reddish-yellow, medium acid fine sandy loam. The underlying material is neutral, reddish-yellow fine sand.

This association is used mostly as range. It should not be cultivated unless irrigated. The soils absorb moisture readily and, during periods of normal rainfall, lose no water through runoff, but they are highly susceptible to soil blowing. Some cropped areas have been damaged severely. (Dryland capability unit VIe-1; irrigated capability unit IVe-7; Deep Sand range site)

Carey Series

The Carey series consists of gently sloping to moderately sloping, deep, moderately permeable, neutral to mildly alkaline, well-drained soils. These soils are in the uplands in the eastern part of the county. They developed in calcareous, alkaline Permian packsand and soft sandstone. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Carey soil is about 10 inches of reddish-brown, friable, mildly alkaline loam. The subsoil, which extends to a depth of 38 inches, is reddish, friable, crumbly sandy clay loam. The lower part is calcareous. The underlying material is calcareous, red loam. Lime pebbles occur in the upper part.

Typical profile of Carey loam, 1 to 3 percent slopes, in a pasture 1,600 feet north of U.S. Highway No. 82, at a point 1.1 miles west of the South Wichita River bridge on this highway and about 14 miles east of Dickens.

A1—0 to 10 inches, reddish-brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) when moist; moderate, fine, subangular blocky structure; slightly hard when dry, friable when moist; noncalcareous and mildly alkaline; clear boundary.

B2t—10 to 24 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; compound structure—moderate, fine, subangular blocky and weak granular; very hard when dry, friable when moist; about 5 percent worm casts and 2 percent fine pores; few patchy clay skins; noncalcareous and mildly alkaline; gradual boundary.

B3—24 to 38 inches, yellowish-red (5YR 5/6) light sandy clay loam, yellowish red (5YR 4/6) when moist; compound structure—moderate, fine, subangular blocky and weak granular; very hard when dry, friable when moist; few films and threads of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C1ca—38 to 50 inches; red (2.5YR 5/6) loam, red (2.5YR 4/6) when moist; weak granular structure; hard when dry, friable when moist; about 5 percent nodular concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C2—50 to 60 inches +, red (2.5YR 5/6) loam, red (2.5YR 4/6) when moist; hard when dry, very friable when moist; calcareous and moderately alkaline.

When dry, the A1 horizon ranges from brown to reddish brown in hues of 5YR to 7.5 YR. It ranges from loam to silt loam or very fine sandy loam in texture and from 8 to 14 inches in thickness. The B2t horizon, when dry, ranges from red to reddish brown in hues of 2.5YR to 5YR, values of 4 to 5, and chromas of 3 to 6. The texture ranges from light sandy clay loam to clay loam, and the thickness ranges from 10 to 24 inches. The sand fraction throughout the subsoil is dominantly very fine. When dry, the B3 horizon ranges from 2.5YR to 5YR in hue, from 4 to 6 in value, and from 4 to 7 in chroma. It ranges from heavy very fine sandy loam to light sandy clay loam in texture and from 10 to 24 inches in thickness. The depth to the C1ca horizon ranges from 30 to 70 inches. This horizon is inconspicuous in many places and is lacking in some.

Carey soils have a thicker and more clayey subsoil than Quinlan and Woodward soils, both of which are calcareous.

Carey loam, 1 to 3 percent slopes (CaB).—This soil has the profile described as typical of the Carey series. It is in the valleys of small drainageways.

Included with this soil in mapping were small areas of Woodward soils. Also included were areas of silt loam and very fine sandy loam, totaling about 15 percent of the acreage.

This Carey soil is moderate to high in natural fertility. It is used for both dryland and irrigated crops. Internal drainage is good. Water erosion and soil blowing are slight hazards. (Dryland capability unit IIe-1; irrigated capability unit IIe-1; Mixedland range site)

Carey loam, 3 to 5 percent slopes (CaC).—This soil is similar to the one described for the series, but the surface layer is only about 8 inches thick and the subsoil extends to a depth of only 36 inches. The areas are in the valleys above small drainageways, some of which have been cut deeply by geologic erosion. They are downslope from Woodward and Quinlan soils.

Included with this soil in mapping were areas of Woodward soils less than 10 acres in size. Also included were areas of very fine sandy loam, totaling about 15 percent of the acreage.

This Carey soil is moderately fertile and is suitable for cultivation. Soil blowing is a slight hazard, and water erosion is a moderate hazard. (Dryland capability unit IIIe-2; irrigated capability unit IIIe-2; Mixedland range site)

Colorado Series

The Colorado series consists of nearly level and slightly concave, deep, dark-colored soils on narrow flood plains. These soils developed in stratified, moderately fine textured and moderately coarse textured alluvium. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Colorado soil is about 6 inches of brown, friable, calcareous heavy fine sandy loam. The underlying material to a depth of 60 inches or more is brown, calcareous, stratified fine sandy loam, sandy clay loam, and clay loam. The average texture is sandy clay loam.

Typical profile of a Colorado fine sandy loam, on the flood plain of a stream about 1 mile north and 0.5 mile east of the intersection of State Routes 70 and 208, in the Steele Hill community.

A1—0 to 6 inches, brown (7.5YR 5/3) heavy fine sandy loam, dark brown (7.5YR 3/3) when moist; weak granular structure; soft when dry, friable when moist; calcareous and moderately alkaline; clear boundary.

C—6 to 60 inches +, brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 3/4) when moist; weak, thick and thin, platy structure, related to stratification and the evident bedding planes; some strata are redder or sandier than the matrix; slightly hard when dry, friable when moist; calcareous and moderately alkaline.

The average texture of the uppermost 40 inches ranges from heavy fine sandy loam to clay loam. When dry, the A horizon ranges from dark grayish brown to reddish brown in hues of 5YR to 10YR. It is 1.5 to 2 value units darker when moist. The texture ranges from clay loam to loamy fine sand, and the thickness ranges from 2 to 10 inches. When dry, the C horizon ranges from grayish brown to reddish brown in hues of 5YR to 10YR. The structure ranges from weak granular to thin platy; it is granular where there are many worm casts. Gypsum and strata of fine sand or clay occur in some places.

Colorado soils are less clayey than Mangum soils. They are more stratified than Spur soils.

Colorado soils (Cd).—These soils are on long flood plains that are 50 to 500 feet wide and have a slope of less than 1 percent. They occur in most parts of the county.

The surface layer typically is about 6 inches of brown, friable, calcareous heavy fine sandy loam or loam. Below the surface layer and extending to a depth of 60 inches or more, the material is brown, calcareous, stratified fine sandy loam, sandy clay loam, and clay loam. The average texture is sandy clay loam.

Included with these soils in mapping were small areas that are noncalcareous to a depth of 6 feet or more, small areas southeast of Soldier Mound that are moderately saline, and a few areas near Afton in which the water table is within 6 inches of the surface.

These Colorado soils are high in natural fertility, but flooding limits their use largely to range or pasture. Most of the acreage is used as range. Side-oats grama, blue grama, vine-mesquite, and western wheatgrass are the chief native plants. A few areas are cultivated to annual pasture crops, but these crops are frequently damaged by floods. (Dryland capability unit Vw-2; Loamy Bottomland range site)

Cottonwood Series

The Cottonwood series consists of nearly level and slightly concave, moderately alkaline soils along drainageways and on ridges. These soils developed in loamy, calcareous gypsum. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Cottonwood soil is about 6 inches of dark grayish-brown, friable, calcareous loam. Beneath this layer is several feet of calcareous, weakly cemented gypsum.

Typical profile of a Cottonwood loam in a native pasture 500 feet north of a county road, at a point 0.2 mile east and 3 miles north of Gilpin.

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; slightly hard when dry, friable when moist; about 10 percent worm casts; calcareous and moderately alkaline; abrupt boundary.

C—6 to 60 inches +, white (10YR 8/1), weakly cemented, weakly calcareous material, mainly gypsum.

When dry, the A horizon ranges from dark grayish brown to reddish brown in hues of 5YR to 10YR. It ranges from very fine sandy loam to clay loam in texture and from 2 to 10 inches in thickness. The value is 3.5 or more below a depth of 7 inches. The C horizon generally is white, but it is brownish or mottled with brown in some places. This material ranges from very hard to soft and is noncalcareous in a few places.

Cottonwood soils are much shallower and are more permeable than Abilene soils. They are shallower than Quinlan soils, which do not contain gypsum.

Cottonwood soils, 1 to 3 percent slopes (CoB).—These soils have the profile described as typical of the Cottonwood series. They occur above small drainageways. The areas generally are less than 50 acres in size, but a few are more than 100 acres.

Included with these soils in mapping were small areas of a soil that is similar but has a surface layer more than 10 inches thick. Most areas contain a few spots, less than 100 feet across, of exposed soft gypsum.

These soils are not suitable for cultivation, because they are shallow to gypsum and are low in fertility. They are used mostly as range. The native vegetation is a sparse cover of buffalograss and mesquite. (Dryland capability unit VIIs-1; Gypland range site)

Enterprise Series

The Enterprise series consists of gently sloping to moderately sloping, deep, well-drained soils of the uplands. These soils developed in calcareous and alkaline very fine sandy loam blown from the creeks in the eastern part of the county. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Enterprise soil is about 16 inches of reddish-brown, very friable, mildly alkaline very fine sandy loam. Beneath this layer is several feet of yellowish-red, very friable, calcareous very fine sandy loam.

Typical profile of Enterprise very fine sandy loam, 3 to 5 percent slopes, in a native pasture 0.3 mile east of Croton Creek along the ranch trail from Girard, in Kent

County, to the Beggs Ranch headquarters, which is about 20 miles east-southeast of Spur.

A1—0 to 16 inches, reddish-brown (5YR 5/3.5) very fine sandy loam, dark reddish brown (5YR 3/3.5) when moist; weak subangular blocky structure; slightly hard when dry, very friable when moist; about 15 percent worm casts; noncalcareous and mildly alkaline; gradual boundary.

C—16 to 72 inches +, yellowish-red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) when moist; weak subangular blocky structure; slightly hard when dry, very friable when moist; about 20 percent worm casts; calcareous and moderately alkaline.

When dry, the A1 horizon ranges from light reddish brown to brown in hues of 5YR to 7.5YR. The thickness ranges from 8 to 20 inches. The C horizon, when dry, ranges from light reddish brown or yellowish red to brown in hues of 5YR to 7.5YR. It ranges from weakly calcareous to strongly calcareous.

Enterprise soils have a thicker solum than Quinlan and Woodward soils. Enterprise soils are underlain by uniform very fine sandy loam, whereas Yahola soils are underlain by stratified sandy and loamy material.

Enterprise very fine sandy loam, 1 to 3 percent slopes (EnB).—This soil is above Croton Creek. It has a profile similar to the one described as typical for the series, but the surface layer is about 17 inches thick.

Included with this soil in mapping were areas of Woodward and Yahola soils less than 5 acres in size.

This soil is high in natural fertility. It is suitable for cultivation but is used as range. The native vegetation consists mainly of blue grama, side-oats grama, buffalograss, sand dropseed, mesquite, and cactus. Soil blowing and water erosion are slight hazards. (Dryland capability unit IIe-1; irrigated capability unit IIe-1; Mixedland range site)

Enterprise very fine sandy loam, 3 to 5 percent slopes (EnC).—This soil has the profile described as typical of the Enterprise series. It occurs above the flood plain of Croton Creek. The slope is dominantly about 3.8 percent.

Included with this soil in mapping were areas of Quinlan and Woodward soils less than 15 acres in size and a few areas of silt loam or loam.

This soil is high in natural fertility. It is used as range. The native vegetation consists mainly of blue grama, side-oats grama, buffalograss, sand dropseed, mesquite, and a little cactus. Soil blowing is a slight hazard, and water erosion is a moderate hazard. (Dryland capability unit IIIe-2; irrigated capability unit IIIe-2; Mixedland range site)

Latom Series

The Latom series consists of sloping, very shallow soils on smooth, convex ridges and knolls in the southern half of the county. These soils developed in material weathered from sandstone or from conglomerate rock containing quartzitic pebbles and sandstone. The vegetation under which they developed consisted mainly of short grasses but included some mid grasses and small woody plants.

The surface layer of a typical Latom soil is about 9 inches of brown and reddish-brown, friable, mildly alkaline gravelly loam. Beneath this layer is hard rock consisting of sandstone and quartz pebbles.

Typical profile of a Latom gravelly loam (fig. 8), in a native pasture 100 feet south of a county road and 0.99 mile west of the intersection of this road and State Route 70; this intersection is approximately 3.0 miles north of Spur.

A11—0 to 6 inches, brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) when moist; massive (structureless) to weak subangular blocky structure; slightly hard when dry, friable when moist; about 35 percent fine quartzitic pebbles; noncalcareous and mildly alkaline; clear boundary.

A12—6 to 9 inches, reddish-brown (5YR 4/3) gravelly loam, dark reddish brown (5YR 3/3) when moist; massive (structureless) to weak subangular blocky structure; slightly hard when dry, friable when moist; about 35 percent fine quartzitic pebbles; calcareous; abrupt boundary.

R—9 to 12 inches +, indurated conglomerate of quartzitic pebbles and sandstone.

When dry, the A11 horizon ranges from brown to reddish brown in hues of 5YR to 10YR. It ranges from gravelly loam to fine sandy loam in texture and from 2 to 8 inches in thickness. This horizon is calcareous in some places. The A12 horizon, when dry, ranges from reddish brown to pale brown in hues of 5YR to 10YR. This horizon is noncalcareous in a few places. The quartzitic pebbles are coated with calcium carbonate in some places.

Latom soils are shallower and less clayey than Vernon soils. They are much shallower than Miles and Olton soils.

Latom gravelly soils, 3 to 8 percent slopes (LaD).—These soils have the profile described as typical of the Latom series. They occur on smooth, convex knobs or

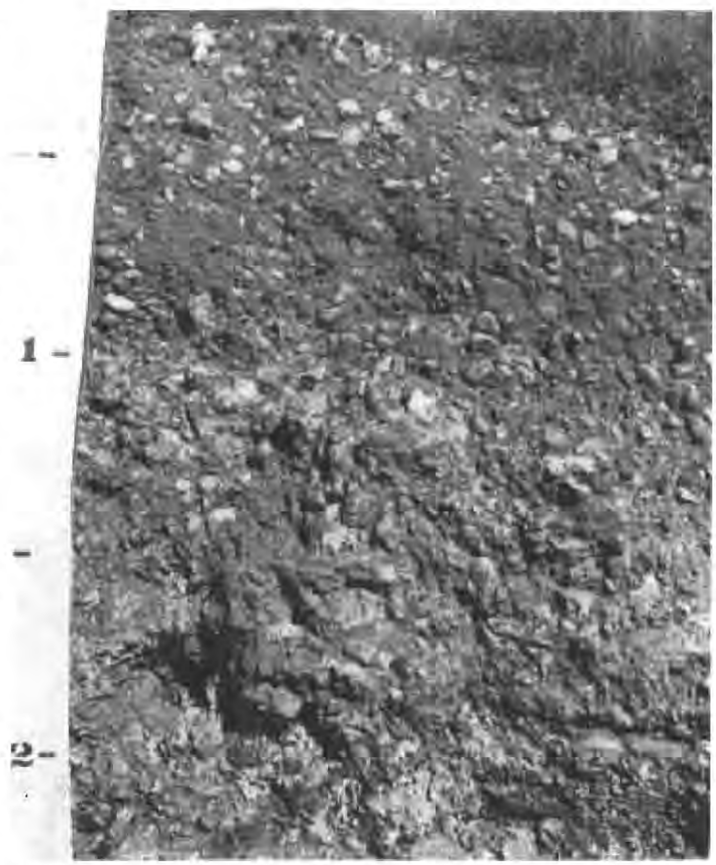

Figure 8.—Profile of a Latom gravelly loam showing a large number of quartzitic pebbles.

ridges and are oval in shape and generally less than 15 acres in size. The dominant slope is about 5 percent.

Included with these soils in mapping were spots of exposed rock less than 2 acres in size and small areas of Miles, Olton, and Weymouth soils.

These soils are not suitable for cultivation, because they are very shallow and are low in fertility. Most areas are used as range. The native vegetation consists mainly of buffalograss, blue grama, catclaw, and dalea. (Dryland capability unit VIIs–1; Very Shallow range site)

Lincoln Series

The Lincoln series consists of nearly level, deep, sandy soils on the flood plains of the major drainageways in the county. These soils developed in sandy alluvial deposits. The vegetation under which they developed consisted of tall grasses.

The surface layer of a typical Lincoln soil is about 15 inches of light-brown, loose, calcareous fine sand. Beneath this layer is several feet of light yellowish-brown, loose, calcareous fine sand that contains layers of loamy fine sand.

Typical profile of a Lincoln fine sand in an abandoned field along the flood plain of Cottonwood Creek, at a point about 1 mile southeast of the headquarters of the Spur Headquarters Ranch.

A1—0 to 15 inches, light-brown (10YR 6/3) fine sand, brown (10YR 5/3) when moist; single grain; loose when dry and when moist; calcareous and moderately alkaline; gradual boundary.

C—15 to 60 inches +, light yellowish-brown (10YR 6/4), stratified loamy fine sand and fine sand; structureless; loose when dry and when moist; calcareous and moderately alkaline.

When dry, the A1 horizon ranges from light brown to light yellowish brown in hues of 7.5YR to 10YR, values of 6 to 7, and chromas of 3 to 4. The texture ranges from fine sand to fine sandy loam, and the thickness ranges from 6 to 30 inches. The C horizon, when dry, ranges from brown to light yellowish brown in hues of 7.5YR to 10YR, values of 5 to 7, and chromas of 3 to 4.

Lincoln soils are sandier and lighter colored throughout the solum than Spur soils.

Lincoln soils (Ln).—The soils of this mapping unit occur on flood plains, mostly along creeks and drainageways. They are above the stream channel and below the adjoining Spur soils. The slope is dominantly 0.7 percent or less.

The surface layer of these soils is variable and ranges from fine sand to fine sandy loam in texture. A profile typical of a Lincoln fine sand is described for the Lincoln series.

Included with these soils in mapping were areas of Spur soils totaling about 5 percent of the acreage; spots less than 1 acre in size of silt loam or silty clay loam over sand; and a few areas that contain thin strata that range in texture from silt loam to gravel. Also included were old creekbeds that were cut off from the main channel when the water changed course.

These soils are low in natural fertility. They are subject to recurrent floods and are highly susceptible to blowing. The water table normally is only 5 to 10 feet below the surface. (Dryland capability unit Vw–1; Sandy Bottomland range site)

Lincoln loamy fine sand, loamy substratum variant (Lc).—This soil is on the high flood plains adjacent to Duck Creek. It adjoins Spur soils. The areas are irregular in shape and generally less than 100 acres in size. The slope is dominantly 0.5 percent or less.

The surface layer of this soil typically is about 30 inches thick. Below a depth of 30 inches is several feet of dark grayish-brown, friable, calcareous clay loam.

Included with this soil in mapping were areas of Spur fine sandy loam less than 5 acres in size and small areas of fine sand.

This soil is flooded occasionally and is highly susceptible to blowing. Most areas are cultivated, and during windy periods, small dunes tend to form. Sand dunes 1 to 4 feet high and 6 to 15 feet wide at the base have accumulated along many fences. Locally, the plow layer has been winnowed, and as a result the texture is fine sand. (Dryland capability unit IVe–4; irrigated capability unit IIIe–8; Sandy Bottomland range site)

Lofton Series

The Lofton series consists of nearly level and slightly concave, deep, very slowly permeable soils of the uplands. These soils are subject to swelling and shrinking during alternate wet and dry periods. They occur on the High Plains and are above playas and below the surrounding Pullman soils. Lofton soils formed in moderately fine textured, calcareous sediments. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Lofton soil is about 8 inches of dark grayish-brown, friable, mildly alkaline clay loam. The subsoil, which extends to a depth of 64 inches, is grayish, very firm clay that is calcareous in the lower part. The underlying material is light-gray, friable clay or silty clay loam. It has numerous lime pebbles in the upper part.

Typical profile of Lofton clay loam in a cultivated field 50 feet north of a county road, at a point 1.25 miles north and 1.5 miles east of McAdoo.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; structureless; slightly hard when dry, friable when moist; noncalcareous and mildly alkaline; abrupt boundary.

B2t—8 to 28 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; compound structure—strong, medium, blocky to moderate, medium, granular; very hard when dry, very firm when moist; distinct clay films; calcareous in lower 8 inches and moderately alkaline; gradual boundary.

B3—28 to 64 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) when moist; compound structure—strong, medium, blocky and weak granular; very hard when dry, very firm when moist; distinct clay films on peds; about 10 percent fine calcium carbonate concretions that increase in number with depth; calcareous and moderately alkaline; gradual boundary.

C1ca—64 to 72 inches, light-gray (10YR 7/2) clay, light brownish gray (10YR 6/2) when moist; very hard when dry, very firm when moist; about 15 percent fine and medium soft masses and concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C2—72 to 80 inches +, light-gray (10YR 7/1) silty clay loam, gray (10YR 6/1) when moist; very hard when dry, very firm when moist; about 10 percent fine soft

masses and concretions of calcium carbonate; calcareous and moderately alkaline.

When dry, both the A and B2t horizons range from brown to dark brown or gray in hues of 10YR to 7.5YR, values of 3 to 5, and chromas of 1 to 2. The A horizon ranges from 6 to 15 inches in thickness. The B2t horizon has a compound structure that ranges from moderate to strong, fine to medium, blocky to subangular blocky and weak to moderate granular. This horizon ranges from 16 to 26 inches in thickness and from neutral to moderately alkaline in reaction. It is noncalcareous where the reaction is neutral and is calcareous where the reaction is moderately alkaline. The B3 horizon, when dry, ranges from brown to light brownish gray in hues of 7.5YR to 10YR, values of 4 to 6, and chromas of 1 to 3. The structure is compound and ranges from moderate to strong in distinctness, from medium to coarse in size, and from blocky to subangular blocky in shape, or is weak to moderate granular. This horizon normally is calcareous. It ranges from 24 to 40 inches in thickness. The depth to the C1ca horizon ranges from 50 to 70 inches. The amount of calcium carbonate ranges from 10 to 30 percent. The depth to the parent material ranges from 60 to 80 inches.

Lofton soils are browner than Randall soils and have a less clayey surface layer.

Lofton clay loam (Lo).—This soil has the profile described as typical of the Lofton series. It occurs in slightly concave areas. The slope is dominantly 0.5 percent or less.

Included with this soil in mapping were areas of Randall and Pullman soils, totaling about 10 percent of the acreage.

This Lofton soil is high in natural fertility, but a hard crust forms on it after rains and deep cracks extend to a depth of 20 inches or more during dry periods. Droughtiness is a limitation resulting from very slow permeability and the shallow penetration of moisture during most rains. Soil blowing is only a slight hazard. Most of the acreage is cultivated, mainly to cotton, sorghum, and wheat. The native vegetation consists mostly of buffalograss and blue grama. (Dryland capability unit IIIce-1; irrigated capability unit IIs-1; Deep Hardland range site)

Mangum Series

The Mangum series consists of nearly level, deep, very slowly permeable soils on the flood plains of Dockum Creek and Spade Draw. These soils are subject to swelling and shrinking during alternate wet and dry periods. They developed in fine-textured, calcareous alluvial sediments. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Mangum soil is about 10 inches of brown, friable, calcareous clay loam. The underlying material is reddish-brown, chiefly massive, calcareous clay to a depth of 36 inches. The material below a depth of 36 inches is similar but is less porous and more massive. In many places it contains crystals of lime and gypsum.

Typical profile of a Mangum clay loam on the flood plain of Spade Draw, approximately 300 feet west and 2 miles south of the headquarters of the Texas Agricultural Experiment Station.

Ap—0 to 10 inches, brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) when moist; weak granular structure; hard when dry, friable when moist; calcareous and moderately alkaline; abrupt boundary.

C1—10 to 36 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; weak blocky structure or massive; very hard when dry, friable when moist; few pores; few films and threads of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C2—36 to 48 inches +, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; weak blocky structure or massive; very hard when dry, firm when moist; few films, threads, and whitish crystalline masses of calcium carbonate; calcareous and moderately alkaline.

When dry, the Ap horizon ranges from brown to reddish brown in hues of 5YR to 7.5YR. The structure is either weak granular or weak subangular blocky. The texture ranges from loam to heavy clay loam, and the thickness from 5 to 18 inches. The C horizon, when dry, ranges from brown to reddish brown or red in hues of 2.5YR to 7.5YR. The structure ranges from weak blocky to weak subangular blocky or is massive. Strata as much as 2 inches thick occur in some places. These strata range from fine sandy loam to loam in texture, but the average texture of the C horizon is heavy clay loam or clay.

Mangum soils are underlain by more clayey material than Spur soils. They are much less sandy than Yahola soils.

Mangum soils (Mo).—These soils are on the flood plains of Dockum Creek and Spade Draw. The slope is less than 1 percent.

The surface layer is variable in texture and ranges from loam to heavy clay loam. A profile of a Mangum clay loam is described as typical for the Mangum series.

Included with these soils in mapping were small areas of Spur and Yahola soils and a few areas southeast of Soldier Mound of a moderately saline soil.

These soils are high in natural fertility, but they crack to a depth of 20 inches or more during dry periods. The native vegetation consists of buffalograss, blue grama, vine-mesquite, mesquite trees, and hackberry trees. Cultivated crops are sorghum and small grain. (Dryland capability unit IIce-3; irrigated capability unit I-3; Loamy Bottomland range site)

Mansker Series

The Mansker series consists of convex, gently sloping to sloping, alkaline soils of the uplands. They are shallow over caliche. These soils are mostly in the northwestern part of the county. They developed in moderately fine textured, calcareous sediments. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Mansker soil is about 8 inches of grayish-brown, friable, porous, calcareous loam. The subsoil, which extends to a depth of 16 inches, is brown, friable, porous, calcareous clay loam. The underlying material consists of several feet of white or very pale brown, calcareous clay loam or caliche. The upper part contains many limy pebbles.

Typical profile of Mansker loam, 3 to 5 percent slopes, in a native pasture 500 feet north and 100 feet west of a corner of a county road, at a point 2 miles north and 2 miles east of Glenn.

A1—0 to 8 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/4) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist; about 10 percent worm casts and 2 percent fine pores; calcareous and mildly alkaline; gradual boundary.

B2ca—8 to 16 inches, brown (10YR 5/3) clay loam; dark brown (10YR 4/3) when moist; compound structure—weak granular and weak subangular blocky; hard when dry, friable when moist; about 30 percent worm casts and 2 percent fine pores; calcareous and mildly alkaline; clear boundary.

C1ca—16 to 36 inches, white (10YR 8/2) clay loam, pale brown (10YR 6/3) when moist; structureless; hard when dry, friable when moist; about 5 percent worm casts, 2 percent fine pores, and 40 percent soft masses and fine to medium concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C2—36 to 66 inches +, very pale brown (10YR 7/4) clay loam, yellowish brown (10YR 5/4) when moist; structureless; hard when dry, friable when moist; 20 percent soft masses and concretions of calcium carbonate; calcareous and moderately alkaline.

When dry, the A horizon generally ranges from brown or grayish brown to dark brown in hues of 7.5YR to 10YR, but in some places it is reddish brown in a hue of 5YR. The texture ranges from loam to clay loam and, in some places, to fine sandy loam. The thickness ranges from 4 to 10 inches. The B2ca horizon, when dry, ranges from brown to grayish brown and, in a few places, to reddish brown. The hue ranges from 5YR to 10YR. The subangular blocky structure ranges from weak to moderate in distinctness and from fine to medium in size. In some places the structure is weak to moderate, coarse, prismatic, and in others it is weak to moderate, fine to medium, granular. This horizon ranges from loam to clay loam or sandy clay loam in texture and from 6 to 16 inches in thickness. The depth to the C1ca horizon ranges from 10 to 24 inches. The amount of calcium carbonate ranges from 20 to 60 percent.

Mansker soils resemble Potter soils but have a thicker solum. They have a thinner solum than Berda and Miles soils and are higher in content of calcium carbonate than Miles soils. Mansker soils are darker colored than Veal soils.

Mansker loam, 1 to 3 percent slopes (McB).—This soil occurs as narrow bands on the crests of ridges and as oval-shaped areas on knolls. The dominant slope is about 2.3 percent.

The profile is similar to the one described for the Mansker series, but the surface layer is about 9 inches thick and the subsoil extends to a depth of 18 inches.

Included with this soil in mapping were areas of Weymouth and Berda soils, totaling about 10 percent of the acreage. Also included were scattered gravelly spots and, in local areas of the High Plains, areas of clay loam.

Although this Mansker soil is poorly suited to cultivation, slightly more than one-third of it is used for crops. It is limy and has a caliche layer that retards root growth. Soil blowing is a slight hazard, and water erosion is a slight to moderate hazard. (Dryland capability unit IIIe-4; irrigated capability unit IIIe-4; Deep Hardland range site)

Mansker loam, 3 to 5 percent slopes (McC).—This soil has the profile described as typical of the Mansker series. It occurs on ridges and knolls. The areas are oval or irregular in shape and are mostly less than 25 acres in size. The dominant slope is about 3.8 percent.

Included with this soil in mapping were areas of Berda, Potter, and Weymouth soils, totaling about 10 percent of the acreage, and scattered spots of a gravelly soil.

About one-fourth the acreage of this Mansker soil is cultivated. The areas are poorly suited to cultivation because the caliche layer near the surface retards root growth. Soil blowing is a slight hazard, and water erosion is a moderate hazard. (Dryland capability unit IVe-1; Deep Hardland range site)

Meno Series

The Meno series consists of nearly level to gently undulating, deep, moderately permeable soils of the uplands. These soils occur in the valleys in the northern part of the county. They receive extra water from runoff. They developed in water-laid deposits or plains outwash. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Meno soil is about 12 inches of dark-brown to dark grayish-brown, friable, neutral fine sandy loam. The subsoil, which extends to a depth of about 40 inches, is dark-brown, friable, mildly alkaline to moderately alkaline sandy clay loam. This layer grades to pale brown with increasing depth and is calcareous below a depth of 28 inches. The underlying material is white to pale-brown, calcareous loam to fine sandy loam or caliche.

Typical profile of Meno fine sandy loam in a cultivated field 50 feet south of a county road, at a point 1.8 miles north and 0.5 mile west of East Afton.

Ap—0 to 8 inches, dark-brown (10YR 4/3) fine sandy loam, slightly darker brown (10YR 3/3) when moist; weak granular structure; slightly hard when dry, friable when moist; noncalcareous and neutral; abrupt boundary.

A1—8 to 12 inches, dark grayish-brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak granular structure; slightly hard when dry, friable when moist; noncalcareous and neutral; gradual boundary.

B2t—12 to 28 inches, dark-brown (10YR 4/3) sandy clay loam, slightly darker brown (10YR 3/3) when moist; compound structure—moderate, very coarse, prismatic and moderate, medium, subangular blocky; hard when dry, friable when moist; about 15 percent worm casts and 5 percent very fine to fine pores; noncalcareous and mildly alkaline; gradual boundary.

B3—28 to 40 inches, pale-brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) when moist; compound structure—moderate, very coarse, prismatic and moderate, medium, subangular blocky; hard when dry, friable when moist; about 10 percent worm casts and 5 percent very fine to fine pores; few films and threads of calcium carbonate on surface of peds; surface of peds is weakly calcareous, inside of peds is noncalcareous; moderately alkaline; gradual boundary.

C1ca—40 to 62 inches, white (10YR 9/1) loam, white (10YR 8/1) when moist; massive; hard when dry, friable when moist; about 10 percent of peds covered with films and threads of calcium carbonate; 10 percent soft segregations of calcium carbonate; calcareous and moderately alkaline; diffuse boundary.

C2—62 to 80 inches +, pale-brown (10YR 6/3) heavy fine sandy loam; brown (10YR 5/3) when moist; massive; hard when dry, friable when moist; calcareous.

When dry, the A horizon ranges from dark grayish brown to brown or dark brown in hues of 7.5YR to 10YR, values of 3 to 5, and chromas of 2 to 3. This horizon ranges from fine sandy loam to loamy fine sand in texture and from 8 to 24 inches in thickness. Where it is loamy fine sand, it generally is more than 12 inches thick. The B2t horizon, when dry, ranges from dark brown to brown in hues of 7.5YR to 10YR, values of 3 to 5, and chromas of 2 to 4. The texture ranges from loam to sandy clay loam. The B2t horizon is calcareous in about 25 percent of the areas. The B3 horizon is lacking in about 50 percent of the areas. This layer is one or two values lighter colored than the B2t horizon; the ranges in hue

and chroma are the same as those of the B2t horizon. The B3 contains scattered spots and streaks that are redder, grayer, and yellower than the matrix. The C1ca horizon does not occur in about 25 percent of the areas and is ill defined in many places. The deposition of calcium carbonate by a high water table has modified the C horizon in a few places.

Meno soils lack the red color of Miles soils. They are sandier and have a less blocky structure than Abilene soils. Meno soils are less clayey than Portales soils, which are calcareous.

Meno fine sandy loam (Md).—This soil has the profile described as typical of the Meno series. It occurs in broad valleys and is downslope from Miles soils. The dominant slope is 0.5 percent or less.

Included with this soil in mapping were areas of Portales and Abilene soils less than 10 acres in size. Also included were limy areas resulting from a consistently high water table.

This Meno soil is suitable for growing cotton, small grain, and sorghum. Water erosion is not a hazard, because water drains off at a safe rate. Soil blowing is a moderate hazard. In a few areas the surface layer has been winnowed and is now a loamy fine sand. (Dryland capability unit IIIe-3; irrigated capability unit IIe-3; Sandy Loam range site)

Meno loamy fine sand (Me).—This soil occurs in the valleys. Only in undulating areas does the slope exceed 1 percent. The profile is similar to the one described for the series, but the surface layer typically is about 15 inches of brown, loose, neutral loamy fine sand. The subsoil is dark grayish brown. It extends to a depth of only 38 inches and is underlain by calcareous, whitish sandy clay loam or caliche.

Included with this soil in mapping were a few small areas of fine sandy loam; areas that have a subsurface layer of blocky clay loam, totaling about 10 percent of the acreage; and, near East Afton, a few calcareous areas resulting from a consistently high water table.

Most of this Meno soil is cultivated and is suitable for growing cotton, sorghum, and wheat. Water erosion is not a hazard, because the infiltration rate is high and little water runs off during normal rains. Soil blowing is a serious hazard. As a result of blowing, small sand dunes form in fields and along fences, especially during spring. In a few areas the surface layer has been winnowed and is now a fine sand. (Dryland capability unit IVe-4; irrigated capability unit IIIe-8; Sandyland range site)

Miles Series

The Miles series consists of nearly level to sloping, deep soils on broad plains in the uplands. These soils developed from moderately sandy, water-laid deposits, or plains outwash. The texture of the surface layer is fine sandy loam where the vegetation consisted of short and mid grasses and loamy fine sand where the vegetation consisted of tall and mid grasses.

The surface layer of a typical Miles soil is about 11 inches of reddish-brown, friable, neutral fine sandy loam. The subsoil, which extends to a depth of about 52 inches, is reddish-brown, friable, neutral to mildly alkaline sandy clay loam. The underlying material is reddish-yellow, calcareous sandy clay loam.

Typical profile of Miles fine sandy loam, 1 to 3 percent slopes, in a cultivated field 1,000 feet north of a county road, at a point 3.9 miles west of the intersection of Farm Road 1868 and State Route 70.

Ap—0 to 11 inches, reddish-brown (5YR 5/4) fine sandy loam, dark reddish brown (5YR 3/4) when moist; structureless; slightly hard when dry, friable when moist; noncalcareous and neutral; abrupt boundary.

B21t—11 to 24 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; compound structure—weak, subangular blocky and moderate, very coarse, prismatic; very hard when dry, friable when moist; thin clay skins; about 12 percent worm casts and fine pores; noncalcareous and neutral; gradual boundary.

B22t—24 to 52 inches, reddish-brown (5YR 5/4) light sandy clay loam, slightly darker reddish brown (5YR 3/4) when moist; compound structure—weak, subangular blocky and moderate, very coarse, prismatic; hard when dry, friable when moist; thin clay films; noncalcareous and mildly alkaline; gradual boundary.

C—52 to 60 inches +, reddish-yellow (5YR 6/6) light sandy clay loam, yellowish red (5YR 5/6) when moist; structureless; hard when dry, friable when moist; calcareous and moderately alkaline.

When dry, the A horizon ranges from brown to reddish brown in hues of 5YR to 7.5YR; values of 5 and 4, and occasionally 6 where the texture is loamy fine sand; and chromas of 3 to 4. The texture ranges from fine sandy loam to loamy fine sand. In some eroded areas the A horizon is sandy clay loam. The B horizon, when dry, ranges from red or yellowish red to reddish brown in hues of 2.5YR to 5YR. The texture ranges from light sandy clay loam to loam. The subangular blocky structure ranges from weak to moderate in distinctness, and the prismatic structure is coarse or very coarse in size. In about 25 percent of the areas there is a B1 horizon, and in about 40 percent of the areas there is a B3 horizon. The depth to the C horizon or to a Cca horizon ranges from 50 to 72 inches. In 70 percent of the profiles observed, there was no Cca horizon above a depth of 72 inches. The texture of the C horizon ranges from fine sandy loam to sandy clay loam. Sandstone, shale, or clay occurs in some areas at a depth below 50 inches.

Miles soils are less gray and more sandy than Abilene soils. They are redder than Meno soils. Miles soils have a less clayey and less blocky subsoil than Olton soils and a thinner and less sandy surface layer than Brownfield soils.

Miles fine sandy loam, 0 to 1 percent slopes (MfA).—This soil occurs chiefly as broad plains several hundred acres in size. It is below the more sloping Miles soils. The dominant slope is about 0.5 percent.

The profile is similar to the one described for the series, but the surface layer typically is brown and is about 12 inches thick. The subsoil extends to a depth of 60 inches.

Included with this soil in mapping were areas of Olton, Abilene, and Meno soils, totaling about 10 percent of the acreage, and small areas of loam.

Most of this Miles soil is cultivated. Soil blowing is a moderate hazard. The surface layer has been winnowed in a few areas and is now a loamy fine sand. (Dryland capability unit IIIe-3; irrigated capability unit IIe-3; Sandy Loam range site)

Miles fine sandy loam, 1 to 3 percent slopes (MfB).—This soil has the profile described as typical of the Miles series. It occurs chiefly as broad plains several hundred acres in size. The slope is most commonly a little less than 2 percent.

Included with this soil in mapping were small areas of Miles soils that have slopes of less than 1 percent and

some that have slopes of more than 3 percent. Also included were small areas of Olton, Veal, and Mansker soils.

Most of this Miles soil is cultivated. Water erosion is a slight hazard, and soil blowing is a moderate hazard. The surface layer is only 4 to 5 inches thick in some cultivated areas. In spots within cultivated fields, it has been winnowed and is now a loamy fine sand. A few gullies about 12 inches deep have formed on long slopes where runoff has concentrated. (Dryland capability unit IIIe-3; irrigated capability unit IIe-4; Sandy Loam range site)

Miles fine sandy loam, 3 to 5 percent slopes (MfC).—This soil occurs on ridges and knolls. The areas generally are less than 80 acres in size and are outlined by areas of less sloping Miles soils. The slope is most commonly a little less than 4 percent.

The profile is similar to the one described for the series, but the surface layer is only about 9 inches thick and the subsoil extends to a depth of 51 inches.

Included with this soil in mapping were areas of Veal fine sandy loam, totaling about 5 percent of the acreage. About 10 percent consists of areas that have been damaged by moderately severe water erosion. Also included were small areas as much as 75 percent covered with waterworn, quartzitic pebbles.

About two-thirds of this Miles soil is used as range, and about a third is cultivated. The main cultivated crops are sorghum and small grain. Soil blowing and water erosion are moderate hazards. The surface layer is only 3 to 5 inches thick in some cultivated areas. In others runoff has concentrated in drainageways and has formed gullies 1 to 3 feet deep and 4 to 12 feet across. (Dryland capability unit IVe-2; irrigated capability unit IIIe-7; Sandy Loam range site)

Miles fine sandy loam, 5 to 8 percent slopes (MfD).—This soil is on ridges and on side slopes of drainageways. Generally the areas are irregular in shape, are less than 70 acres in size, and are outlined by less sloping Miles soils. The slope is commonly about 6 percent.

The profile is similar to the one described for the series, but the surface layer is only about 7 inches thick and the subsoil extends to a depth of about 51 inches.

Included with this soil in mapping were small areas of Mansker and Veal soils; areas of loamy fine sand, totaling about 10 percent of the acreage; and small areas as much as 30 percent covered with waterworn, quartzitic pebbles.

This Miles soil is not suitable for cultivation, because the slope makes water erosion a serious hazard. It is better suited to range. (Dryland capability unit VIe-6; Sandy Loam range site)

Miles loamy fine sand, 0 to 3 percent slopes (MlB).—This soil occurs mostly as broad plains several hundred acres in size. The slope is most commonly about 1.5 percent.

The profile is similar to the one described for the series, but the surface layer typically is about 16 inches of brown, loose, neutral loamy fine sand (fig. 9). The subsoil extends to a depth of 54 inches and is underlain by red, friable, alkaline fine sandy loam.

Included with this soil in mapping were a few small areas that have lost most of their surface layer through

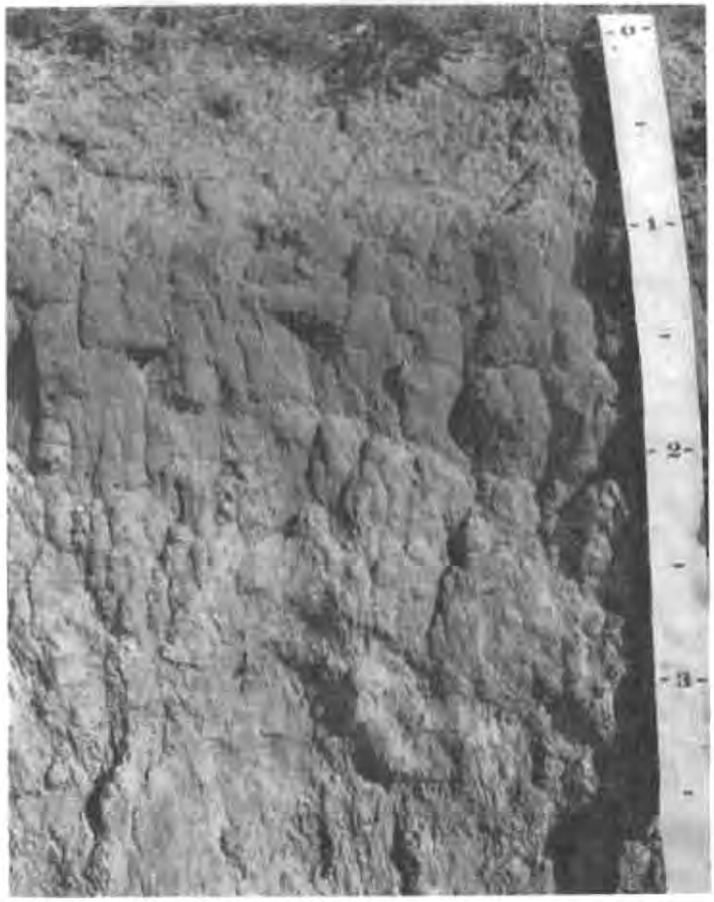

Figure 9.—**Profile of Miles loamy fine sand, 0 to 3 percent slopes, showing prismatic structure in the subsoil.**

erosion. Also included were areas of Miles fine sandy loam and Brownfield fine sand, totaling about 5 percent of the acreage.

Most of this Miles soil is cultivated. Water is absorbed readily, and little runs off even after heavy rains. The capacity for holding moisture and plant nutrients is low. Soil blowing is a severe hazard. Small dunes tend to form in fields, and dunes 1 to 6 feet high and 8 to 20 feet wide at the base have formed along many fences. The surface layer has been winnowed in parts of most fields and is now a fine sand in local areas. (Dryland capability unit IVe-4; irrigated capability unit IIIe-8; Sandyland range site)

Miles loamy fine sand, 3 to 5 percent slopes (MlC).—This soil occurs as areas irregular in shape and generally less than 100 acres in size. The slope is most commonly about 4 percent.

This soil is similar to Miles loamy fine sand, 0 to 3 percent slopes, but the surface layer is about 14 inches thick and the subsoil extends to a depth of 60 inches.

Included with this soil in mapping were small areas of Brownfield soils, areas of fine sandy loam, and areas on the crests of ridges and knolls that are 30 percent covered with waterworn, quartzitic pebbles.

This Miles soil is used mainly as range. Soil blowing and water erosion are severe hazards. The surface layer is only 4 to 5 inches thick in some places. (Dryland

capability unit VIe-2; irrigated capability unit IVe-8; Sandyland range site)

Miles soils, 2 to 6 percent slopes, eroded (MsC2).—The plow layer of these soils is about 8 inches of sandy clay loam to loamy fine sand. The original surface layer consisted of fine sandy loam to loamy fine sand, but varying amounts of sandy clay loam have been brought up from the subsoil during cultivation. The subsoil, which extends to a depth of 52 inches, is reddish brown, friable, neutral to mildly alkaline sandy clay loam. It is underlain by red, friable, alkaline fine sandy loam.

Included with these soils in mapping were small areas of Mansker, Weymouth, and Brownfield soils. Also included were small areas, on crests of hills and knolls, as much as 50 percent covered with quartzitic pebbles.

These soils are cultivated, even though soil blowing and water erosion have removed the surface layer from about 30 percent of the acreage. Both sheet erosion and gully erosion are evident. Gullies up to 3 feet deep and 12 to 15 feet wide occur at intervals of 50 to 300 feet. Downslope from small gullies, stratified deposits 5 to 20 inches thick have accumulated. Sand dunes 3 to 8 feet high and 8 to 25 feet wide at the base have accumulated along fence rows, and dunes averaging 2 feet in height and 15 feet in width at the base have formed in some other areas. (Dryland capability unit VIe-6; Sandy Loam range site)

Mobeetie Series

The Mobeetie series consists of gently sloping to moderately sloping, moderately permeable, moderately alkaline soils. These soils are moderately deep to deep over caliche. They are on alluvial fans or foot slopes below the High Plains escarpment. They developed from moderately coarse textured, calcareous sediments. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Mobeetie soil is about 10 inches of grayish-brown, friable, calcareous fine sandy loam. The subsoil, which extends to a depth of about 23 inches, is pale-brown, friable, porous, calcareous loam. The underlying material is pale-brown, friable, calcareous loam that is coated with lime films.

Typical profile of Mobeetie fine sandy loam, 1 to 3 percent slopes, in a native pasture 3.9 miles north of U.S. Highway No. 82 and 1.0 mile west of the Duck Creek bridge on this highway.

A1—0 to 10 inches, grayish-brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak granular structure; hard when dry, friable when moist; about 5 percent worm casts; calcareous and mildly alkaline; gradual boundary.

B2—10 to 23 inches, pale-brown (10YR 6/3) light loam, brown (10YR 5/3) when moist; compound structure—moderate, medium, prismatic and weak subangular blocky; hard when dry, friable when moist; about 15 percent worm casts; few films and threads of calcium carbonate on surface of peds; calcareous and moderately alkaline; gradual boundary.

Cca—23 to 60 inches, pale-brown (10YR 6/3) light loam, brown (10YR 5/3) when moist; compound structure—weak subangular blocky and weak prismatic; hard when dry, friable when moist; common films and threads of calcium carbonate on surface of peds; calcareous and moderately alkaline.

When dry, the A horizon ranges from brown to light grayish brown or light brown in hues of 7.5YR to 10YR, values of 5 to 6, and chromas of 2 to 4. The structure commonly is weak subangular blocky or weak granular, but it is compound, weak to moderate, prismatic in many places. The texture ranges from fine sandy loam to light loam, and the thickness ranges from 8 to 15 inches.

The B2 horizon, when dry, ranges from brown to pinkish gray or very pale brown in hues of 7.5YR to 10YR, values of 5 to 7, and chromas of 2 to 4. This horizon ranges from fine sandy loam to loam in texture and from 10 to 25 inches in thickness. The structure ranges from weak subangular blocky to weak granular but commonly is compound, weak to moderate, medium, prismatic.

The Cca horizon has about the same color as the B2, but the value is one unit higher in a few profiles. The texture ranges from fine sandy loam to loam.

Mobeetie soils have a thicker solum than Mansker and Veal soils. Mobeetie soils are more sandy than Berda and Mansker soils.

Mobeetie fine sandy loam, 1 to 3 percent slopes (MtB).—This soil has the profile described as typical of the Mobeetie series. It occurs as areas generally less than 50 acres in size and is mainly in the northwestern part of the county. The slope is dominantly about 2 percent.

Included with this soil in mapping were Mansker, Bippus, and Veal soils, totaling about 10 percent of the acreage in some areas.

Most of this Mobeetie soil is used as range, but some is cultivated. The native vegetation consists of buffalograss, blue grama, side-oats grama, and little bluestem. Cotton, sorghum, and small grain are cultivated. Soil blowing is a moderate hazard, and water erosion is a slight hazard. (Dryland capability unit IIIe-3; irrigated capability unit IIe-4; Sandy Loam range site)

Mobeetie fine sandy loam, 3 to 5 percent slopes (MtC).—Most areas of this soil occur below the caprock escarpment in the northeastern quarter of the county. They generally are less than 40 acres in size. The slope is most commonly about 4 percent.

The profile is similar to the one described for the series, but the subsoil extends to a depth of only 22 inches.

Included with this soil in mapping were areas of Berda and Potter soils, totaling about 10 percent of the acreage, and smaller areas of Miles, Bippus, and Veal soils.

Most of this Mobeetie soil is used as range, but some is cultivated. The native vegetation consists of buffalograss, blue grama, side-oats grama, and little bluestem. Sorghum and small grain are the principal cultivated crops. Soil blowing and water erosion are moderate hazards. (Dryland capability unit IVe-6; Sandy Loam range site)

Nobscot Series

The Nobscot series consists of gently undulating to hummocky, deep, well-drained soils of the uplands. These soils are mainly in the northeastern part of the county. They developed from unconsolidated, sandy, windblown material. The vegetation under which they developed consisted mainly of tall grasses and small woody plants, such as shinnery oak and sand sage.

The surface layer of a typical Nobscot soil is about 36 inches of grayish-brown to very pale brown, slightly acid to medium acid fine sand. The subsoil, which

extends to a depth of 54 inches, is reddish-yellow, slightly acid to medium acid fine sandy loam. The underlying material is reddish-yellow, nearly neutral fine sand.

Nobscot soils in Dickens County are mapped only in an association with Brownfield soils. This association is described under the Brownfield series.

Typical profile of a Nobscot fine sand in a native pasture 1,500 feet north of Farm Road 193 and 4 miles east of East Afton.

A1—0 to 6 inches, grayish-brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) when moist; single grain; loose when dry and when moist; slightly acid; clear boundary.

A2—6 to 36 inches, very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) when moist; single grain; loose when dry and when moist; slightly acid to medium acid; gradual boundary.

B2t—36 to 54 inches, reddish-yellow (7.5YR 7/6) light fine sandy loam, reddish yellow (7.5YR 6/6) when moist; structureless; soft when dry, very friable when moist; slightly acid to medium acid; diffuse boundary.

C—54 to 72 inches +, reddish-yellow (7.5YR 7/6) fine sand, reddish yellow (7.5YR 6/6) when moist; structureless; loose when dry and when moist; nearly neutral.

When dry, the A1 horizon ranges from grayish brown and brown to dark brown in hues of 7.5YR to 10YR. The thickness ranges from 4 to 8 inches. The A2 horizon ranges from light brown to very pale brown in hues of 7.5YR to 10YR. The thickness ranges from 20 to 40 inches. The B2t horizon, when dry, ranges from red to reddish yellow in hues of 2.5YR to 7.5YR, values of 5 to 7, and chromas of 5 to 7. This horizon ranges from fine sandy loam to loamy sand in texture and generally contains layers 1 to 3 inches thick of fine sandy loam and fine sand. A B3 horizon occurs in some places; it can be distinguished from the B2t horizon by a slightly coarser texture and a color value one unit higher. The C horizon, when dry, ranges from light red to reddish yellow in hues of 2.5YR to 7.5YR. The texture ranges from loamy fine sand to fine sand.

Nobscot soils have a sandier and thicker surface layer than Miles soils. They have a less clayey subsoil than Brownfield soils.

Olton Series

The Olton series consists of nearly level to gently sloping, deep, slowly permeable soils on broad, smooth uplands. These soils are mostly in the southern half of the county. They developed from medium-textured to moderately fine textured sediments. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Olton soil is about 6 inches of reddish-brown, friable, mildly alkaline clay loam. Beneath the surface layer and extending to a depth of 33 inches, the material is reddish-brown to red, firm, blocky, mildly alkaline clay loam. The underlying material is friable, red, calcareous clay loam or loam. Numerous lime pebbles are in the upper part.

Typical profile of Olton clay loam, 1 to 3 percent slopes, in a cultivated field 200 feet north of State Route 70 and 1.6 miles northwest of Gilpin.

Ap—0 to 6 inches, reddish-brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) when moist; weak granular structure; hard when dry, friable when moist; noncalcareous and mildly alkaline; abrupt boundary.

AB—6 to 9 inches, reddish-brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) when moist; weak, medium, subangular blocky structure; very hard when dry, firm when moist; about 2 percent worm casts and a few fine pores; noncalcareous and mildly alkaline; clear boundary.

B21t—9 to 23 inches, reddish-brown (5YR 4/3.5) heavy clay loam, dark reddish brown (5YR 3/3.5) when moist; moderate, medium, blocky structure; very hard when dry, firm when moist; about 2 percent worm casts and fine pores; noncalcareous and mildly alkaline; gradual boundary.

B22t—23 to 33 inches, red (2.5YR 4/6) heavy clay loam, dark red (2.5YR 3/6) when moist; moderate, medium, blocky structure; very hard when dry, very firm when moist; about 2 percent worm casts and a few fine pores; noncalcareous and mildly alkaline; gradual boundary.

C1ca—33 to 52 inches, red (2.5YR 5/8) clay loam; slightly darker red (2.5YR 4/8) when moist; hard when dry, friable when moist; about 20 percent soft masses and concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C2—52 to 60 inches +, red (2.5YR 5/8) loam, slightly darker red (2.5YR 4/8) when moist; hard when dry, friable when moist; represents slightly altered and weakly consolidated sediments derived in part from the Permian red beds.

When dry, the A horizon ranges from reddish brown to brown in hues of 5YR to 7.5YR. The thickness ranges from 5 to 10 inches. The AB horizon is less than 3 inches thick in many places; in few places is it more than 5 inches thick. The texture of the B21t horizon ranges from heavy clay loam to light clay. The structure ranges from moderate to strong in distinctness, from fine to medium in size, and from blocky to subangular blocky in shape. The B22t horizon, when dry, ranges from red to reddish brown in hues of 2.5YR to 5YR. The structure ranges from weak to moderate in distinctness. The depth to the C1ca horizon ranges from 30 to 48 inches, and the content of calcium carbonate ranges from 10 to 40 percent. The depth to the C2 horizon ranges from 40 to 70 inches.

Olton soils are less sandy than Miles soils and have a more blocky and less prismatic structure. Olton soils are redder than Abilene soils and typically are less deep to the B21t horizon.

Olton clay loam, 0 to 1 percent slopes (OcA).—This soil occurs as broad, mostly flat to slightly convex areas. It is irregular in shape and generally between 100 and 500 acres in size. The slope is dominantly about 0.5 percent.

The profile is similar to the one described for the series, but the surface layer typically is brown and is about 8 inches thick. The subsoil extends to a depth of 36 inches.

Included with this soil in mapping were small areas of Abilene and Miles soils and areas that have a slope of more than 1 percent.

Most of this Olton soil is cultivated. Natural fertility is high, but a thin, hard crust forms on the surface after rains. This soil is droughty because light rains do not penetrate deeply and water runs off during heavy rains. (Dryland capability unit IIce-3; irrigated capability unit I-3; Deep Hardland range site)

Olton clay loam, 1 to 3 percent slopes (OcB).—This soil has the profile described as typical of the Olton series. It occurs mostly as broad, slightly convex plains. The areas are irregular in shape and usually several hundred acres in size. The slope is dominantly about 1.6 percent.

Included with this soil in mapping were areas of Miles and Abilene soils, totaling about 5 percent of the acreage. Also included were areas of Weymouth soils less than 5 acres in size and local areas that are limy below the surface layer.

Most of this Olton soil is used as range, though large areas are cultivated. Natural fertility is high, but a thin, hard crust forms on the surface after rains. Soil blowing is a slight hazard, and water erosion is a moderate hazard. This soil is droughty because moisture does not penetrate deeply and water runs off during heavy rains. (Dryland capability unit IIIe-1; irrigated capability unit IIe-2; Deep Hardland range site)

Portales Series

The Portales series consists of nearly level to slightly concave, deep, moderately permeable soils of the uplands. These soils are near Afton and East Afton. They developed in moderately fine textured, calcareous material, probably old alluvium. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Portales soil is about 15 inches thick and is friable and calcareous. The upper part is grayish-brown loam, and the lower part is dark grayish-brown sandy clay loam. The subsoil, which extends to a depth of about 30 inches, is pale-brown, friable and crumbly, calcareous sandy clay loam. The underlying material is white, calcareous sandy clay loam or caliche.

Typical profile of Portales loam, 0 to 1 percent slopes, in a cultivated field 250 feet north and 500 feet east of the Patton Springs School.

Ap—0 to 8 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; weak granular structure; slightly hard when dry, friable when moist; calcareous and mildly alkaline; gradual boundary.

A1—8 to 15 inches, dark grayish-brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure and weak granular; hard when dry, friable when moist; calcareous and mildly alkaline; gradual boundary.

B2—15 to 30 inches, pale-brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) when moist; fine subangular blocky structure; hard when dry, friable when moist; about 30 percent worm casts and fine pores; calcareous and mildly alkaline; gradual boundary.

C1ca—30 to 46 inches, white (10YR 8/1) sandy clay loam, light gray (10YR 7/1) when moist; massive; hard when dry, friable when moist; about 35 percent calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C2—46 to 60 inches +, white (10YR 8/2) sandy clay loam, light brownish gray (10YR 6/2) when moist; about 15 percent calcium carbonate; calcareous.

When dry, the A horizon ranges from grayish brown to brown in hues of 7.5YR to 10YR, values of 3 to 5, and chromas of 2 to 3. The thickness ranges from 10 to 20 inches. The B2 horizon, when dry, ranges from pale brown to grayish brown or brown in hues of 7.5YR to 10YR. This horizon ranges from 10 to 20 inches in thickness. The depth to the C1ca horizon ranges from 20 to 40 inches. The color, when the soil is dry, ranges from white to pale brown or, in places, pink. The content of calcium carbonate ranges from 15 to 50 percent.

Portales soils have a thicker solum than Mansker and Veal soils and are darker colored in the surface layer than Veal soils.

Portales loam, 0 to 1 percent slopes (PoA).—This soil has the profile described as typical of the Portales series. It occurs as scattered, broad, mostly flat to slightly concave areas near Afton and East Afton. The slope is dominantly about 0.5 percent.

Included with this soil in mapping were areas of Meno and Abilene soils, totaling about 10 percent of the acreage, and small areas of Spur soils.

Nearly all of this Portales soil is cultivated. It is especially good for growing cotton, sorghum, and small grain. Natural fertility is high. Soil blowing and water erosion are only slight hazards. A few small areas receive extra water through runoff during heavy rains. (Dryland capability unit IIce-1; irrigated capability unit I-1; Deep Hardland range site)

Potter Series

The Potter series consists of convex, gently sloping to steep, calcareous soils of the uplands. They are very shallow over caliche. These soils developed in a mixture of loamy earth and caliche in the northwestern part of the county. The vegetation under which they developed consisted of a sparse cover of short and mid grasses.

The surface layer of a typical Potter soil is about 6 inches of grayish-brown, friable, calcareous loam that contains many caliche fragments. Beneath this layer is several feet of pinkish-white, weakly cemented caliche.

Potter soils in Dickens County are mapped only in an association with Berda soils. This association is described under the Berda series.

Typical profile of a Potter loam in a native pasture about 100 feet south of U.S. Highway No. 82 and 7.6 miles west of Dickens.

A1—0 to 6 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; weak granular structure; slightly hard when dry, friable when moist; about 20 percent caliche fragments and fine to medium concretions and soft masses of calcium carbonate.

C—6 to 48 inches +, pinkish-white (7.5YR 8/2) caliche, pinkish gray (7.5YR 7/2) when moist; many concretions and soft masses of calcium carbonate; moderately alkaline.

When dry, the A1 horizon ranges from brown to light brownish gray in hues of 7.5YR to 10YR, values of 5 to 7, and chromas of 2 to 3. The texture ranges from fine sandy loam to clay loam, and the gravel content ranges from 5 to 20 percent. Calcium carbonate concretions cover as much as 30 percent of the surface in many places. In some areas the coarse fragments are quartzitic pebbles. The C horizon is calcareous; about 50 percent consists of calcium carbonate. The upper part of this horizon is weakly cemented in most places.

Potter soils are similar to Mansker soils but are much thinner. Potter soils are underlain by caliche, whereas Latom soils are underlain by sandstone.

Pullman Series

The Pullman series consists of nearly level to gently sloping, deep soils that cover more than 75 percent of the High Plains part of this county. These soils developed from moderately fine textured to fine textured, calcareous, alkaline sediments. Cracks at least 12 inches long and one-fourth to 1 inch wide extend to a depth of 20 inches when these soils are dry. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Pullman soil is about 8 inches of dark grayish-brown, friable, mildly alkaline clay loam. Beneath this layer and extending to a depth of 44 inches, the material is brown, very firm, blocky

clay. It is calcareous below a depth of 22 inches. The underlying material is pink to reddish-yellow, massive, calcareous clay loam. Numerous lime pebbles are in the upper part.

Typical profile of Pullman clay loam, 0 to 1 percent slopes, in a cultivated field 50 feet north of a county road and 1.2 miles east of McAdoo.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; structureless; hard when dry, friable when moist; noncalcareous and mildly alkaline; abrupt boundary.

B21t—8 to 22 inches, brown (7.5YR 4/2) clay, dark brown (10YR 3/2) when moist; strong, medium to coarse, blocky structure; very hard when dry, very firm when moist; evident clay films; noncalcareous; gradual boundary.

B22t—22 to 44 inches, brown (7.5YR 5/3) clay, slightly darker brown (7.5YR 4/3) when moist; strong, medium, blocky structure; horizontal faces of peds tilt about 15 degrees; discontinuous slickensides; very hard when dry, firm when moist; evident clay films; lower few inches about 5 percent fine concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

B3—44 to 56 inches, pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) when moist; about 10 percent soft masses and fine to medium concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C—56 to 70 inches +, reddish-yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) when moist; about 10 percent soft masses and concretions of calcium carbonate; calcareous and moderately alkaline sediments.

The thickness of the A horizon ranges from 3 to 6 inches in uncultivated areas. When dry, the Ap horizon ranges from brown to very dark grayish brown in hues of 7.5YR to 10YR. The B2t horizon, when dry, ranges from brown to yellowish red in hues of 5YR to 7.5YR. The structure ranges from moderate to strong in distinctness, from medium to coarse in size, and from blocky to subangular blocky in shape. The thickness ranges from 24 to 45 inches. The B3 horizon, when dry, ranges from pinkish white to reddish yellow. This horizon occurs at a depth ranging from 27 to 50 inches, but it is lacking in some places. The depth to the C horizon ranges from 50 to more than 75 inches.

Pullman soils are redder than Randall soils and have a less clayey surface layer.

Pullman clay loam, 0 to 1 percent slopes (PuA).—This soil has the profile described as typical of the Pullman series. It occurs on the plains. The slope is most commonly about 0.3 percent.

Included with this soil in mapping were areas of Lofton and Mansker soils, totaling about 5 percent of the acreage, and scattered playas less than 5 acres in size.

Most of this Pullman soil is cultivated, and some is irrigated. Natural fertility is high, but a thin, hard crust forms on the surface after rains. Soil blowing is a slight hazard. Droughtiness is more severe than for the sandy soils of the county. Light rains penetrate less deeply, and more water runs off during heavy rains. Thus, less moisture is available to plants. (Dryland capability unit IIIce-1; irrigated capability unit IIs-1; Deep Hardland range site)

Pullman clay loam, 1 to 3 percent slopes (PuB).—This soil is on convex slopes that surround playas. The slope is most commonly about 1.5 percent.

The profile is similar to the one described for the series, but the surface layer is dark brown and the subsoil extends to a depth of only 38 inches. The material is calcareous below a depth of 20 inches.

Included with this soil in mapping were small areas of Mansker and Olton soils. Also included were small areas where runoff has concentrated and has formed gullies about 1 foot deep and up to 5 feet wide. These gullies are at intervals of 300 to 500 feet.

Most of this Pullman soil is cultivated to cotton, sorghum, and wheat. Natural fertility is high, but a thin, hard crust forms on the surface after rains. Soil blowing and water erosion are slight hazards. The soil is droughty because water infiltrates slowly and the depth of moisture penetration is limited during most rains. (Dryland capability unit IIIe-6; irrigated capability unit IIIe-6; Deep Hardland range site)

Quinlan Series

The Quinlan series consists of convex, gently sloping to sloping, limy soils that are shallow over soft sandstone or packsand. These soils are in the eastern part of the county. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Quinlan soil is about 5 inches of reddish-brown, very friable, calcareous very fine sandy loam. The subsoil, which extends to a depth of 14 inches, is red, very friable, calcareous very fine sandy loam. The underlying material is soft, red sandstone or packsand.

Typical profile of a Quinlan very fine sandy loam in a native pasture 6.75 miles north and 2.5 miles west of Gilpin.

A1—0 to 5 inches, reddish-brown (5YR 4/4) very fine sandy loam, dark reddish brown (5YR 3/4) when moist; weak granular structure; slightly hard when dry, very friable when moist; calcareous and moderately alkaline; gradual boundary.

B2—5 to 14 inches, red (2.5YR 4/6) very fine sandy loam, dark red (2.5YR 3/6) when moist; weak granular structure; slightly hard when dry, very friable when moist; calcareous and moderately alkaline; gradual boundary.

C—14 to 24 inches +, red (2.5YR 5/6), soft, calcareous Permian sandstone or packsand, red (2.5YR 4/6) when moist; about 10 percent bluish mottles.

When dry, the A1 horizon generally is reddish brown in a hue of 5YR, but in some places it is red, reddish yellow, or yellowish red in hues of 2.5YR to 5YR. This horizon ranges from very fine sandy loam to silt loam in texture and from 4 to 10 inches in thickness. The texture of the B2 horizon ranges from very fine sandy loam to silt loam, and the thickness ranges from 2 to 10 inches.

Quinlan soils are shallower than Woodward soils. They lack the layer of gypsum that underlies Cottonwood soils.

Quinlan-Cottonwood complex (Qc).—This complex occurs in irregularly shaped areas ranging from 50 to several hundred acres in size. It is chiefly in the Croton Breaks. Quinlan soils are in the smoother parts and have a dominant slope of about 5 percent. Cottonwood soils are in the sloping, rougher parts and have a dominant slope of about 12 percent (fig. 10).

Both Quinlan and Cottonwood soils occur in each delineation on the map, but the percentage of these soils and of the component soils varies. On the average, most delineations contain 38 percent Quinlan very fine sandy loam, 34 percent Cottonwood very fine sandy loam, 10 percent Woodward very fine sandy loam, 7 percent Rough broken land, 6 percent Quinlan silt loam, and 5

Figure 10.—An area of Quinlan-Cottonwood complex showing Quinlan soils in the smooth areas and Cottonwood soils on the knobs.

percent Alluvial land. In individual areas the percentage of Quinlan soils ranges from 25 to 75, and that of Cottonwood soils from 15 to 60. The percentage of Woodward soils ranges from 0 to 25, of Rough broken land from 5 to 20, and of Alluvial land from 5 to 20.

Included with this complex in mapping were areas less than 20 acres in size of Woodward-Quinlan loams and Rough broken land. Also included were small areas of mixed, fresh alluvial sediments at the narrow bottoms of some of the larger drainageways.

The profile of the Quinlan soils in this complex is similar to the one described as typical of the Quinlan series, but the texture of the surface layer ranges from very fine sandy loam to silt loam. The surface layer of Cottonwood soils typically is about 8 inches of red, very friable, calcareous fine sandy loam. The underlying material consists of several feet of soft, red sandstone containing numerous thin layers of soft, white gypsum.

This complex is not suitable for cultivation, because the soils are steep and shallow or very shallow. Better uses for it are range and wildlife habitat. The basal density of vegetation ranges from 2 to 5 percent where geologic erosion is locally active and from 8 to 15 percent where such erosion is not active. (Quinlan soils—dryland capability unit VIe-3; Mixedland range site; Cottonwood soils—dryland capability unit VIIs-1; Gypland range site)

Randall Series

The Randall series consists of nearly level and slightly concave soils on the floors of playa basins. These soils developed under periodically wet conditions from calcareous and alkaline, moderately fine textured to fine textured sediments. When dry, they crack to a depth of 20 inches or more.

The surface layer of a typical Randall soil is about 10 inches of gray, blocky, firm, mildly alkaline clay. Beneath this and extending to a depth of about 50 inches is gray, massive, very firm, mildly alkaline clay. The underlying material is gray, massive, firm, calcareous and moderately alkaline clay.

Typical profile of Randall clay in a playa 300 feet east of Farm Road 264 and 2.0 miles south of McAdoo.

A1—0 to 10 inches, gray (2.5Y 5/1) clay, dark gray (2.5Y 4/1) when moist; weak blocky structure to massive; hard when dry, firm when moist; noncalcareous and mildly alkaline; gradual boundary.

AC—10 to 50 inches, gray (2.5Y 5/1) clay, dark gray (2.5Y 4/1) when moist; massive; extremely hard when dry, very firm when moist; noncalcareous and mildly alkaline; gradual boundary.

C—50 to 60 inches +, gray (2.5Y 5/1) clay, dark gray (2.5Y 4/1) when moist; massive; extremely hard when dry, firm when moist; calcareous and moderately alkaline.

These soils generally are noncalcareous in the uppermost 50 inches, but they are calcareous throughout in some places. When dry, the A horizon ranges from gray to dark grayish brown or dark brown in hues of 7.5YR to 2.5Y. The texture is either fine sandy loam or clay, and the thickness ranges from 5 to 30 inches. This horizon has weak blocky structure or is massive where the texture is clay. It has granular or subangular blocky structure where the texture is fine sandy loam. The AC horizon, when dry, ranges from dark gray to gray in hues of 10YR to 2.5Y. The structure ranges from subangular blocky to blocky or is massive. The thickness ranges from 10 to 40 inches. The depth to the C horizon ranges from 15 to 60 inches. A few concretions of iron and manganese occur in some areas below a depth of 12 inches, and occasionally there are mottles of olive or pale yellow.

Randall soils are grayer and have a more clayey surface layer than Abilene, Lofton, and Pullman soils.

Randall clay (Ra).—This soil has the profile described as typical of the Randall series. The areas generally are rounded or oval in shape and range from 5 to 160 acres in size. The surface is slightly undulating because the clay shrinks and swells during wet and dry periods. The slope generally is less than 1 percent.

Included with this soil in mapping were small areas of Abilene, Lofton, and Pullman soils and small areas that have a thin layer of loamy material washed from the surrounding soils.

About 60 percent of this Randall soil is cultivated, mostly to sorghum and small grain. These crops are not harvested, however, in wet years. (Dryland capability unit VIw-1; unit IVw-1, if drained; included in the adjoining range sites)

Randall fine sandy loam (Rf).—The areas of this soil generally are oval in shape and less than 50 acres in size. The slope is less than 1 percent.

The profile is similar to the one described for the series, but the surface layer typically is about 10 inches of dark-brown, friable, alkaline fine sandy loam. The subsurface layer extends to a depth of only about 48 inches.

Included with this soil in mapping were small areas of Randall clay and of Abilene, Meno, and Miles soils.

Most of this Randall soil is used for raising cotton and sorghum. These crops are not harvested, however, in wet years. Soil blowing is a moderate hazard. (Dryland capability unit IVw-1; included in the adjoining range sites)

Rock outcrop (Ro).—This land type is mostly north and west of Dickens and east of the caprock escarpment. The slope generally is less than 5 percent. A typical area is 75 percent Rock outcrop, 20 percent rock ledges, and 5 percent Rough broken land and a thin, sandy soil. The soil occurs in areas only a few feet square and consists of calcareous loamy sand and fine sandy loam. The soil material has accumulated between stones and rocks and generally is 1 to 6 inches thick. It is sparsely covered with grasses, small trees, and shrubs. (Dryland capability unit VIIs-1; Very Shallow range site)

Rough broken land (Ru).—Three areas of this land type were mapped: steep, rough and broken areas along the caprock escarpment at the edge of the High Plains; steep, sandstone-capped areas near Dickens; and strongly dissected areas of the Croton Breaks in the southeastern part of the county (fig. 11). The slope ranges from 10 to 70 percent.

The areas along the escarpment are commonly referred to as caprock areas. They are characterized by rims or caps of indurated caliche and by steep, exposed rock of the Ogallala formation or regolith derived from it. Small tracts of Potter soils are common.

Rough broken land near Dickens consists mostly of ridges and bluffs of Triassic sandstone and clay. The ridges and bluffs commonly have sandstone rims below which are clayey materials and scattered sandstone boulders. Small tracts of Vernon and Latom soils are common.

Most areas of Rough broken land are in the Croton Breaks. They are characterized by deep gullies and by ridges and bluffs of Permian sandstone and packsand. Geologic erosion has formed gullies in the soil material, which consists of highly erodible sand and silt. Most of the ridges and bluffs occur along Croton Creek and its tributaries. Here, the areas are interbedded with layers of gypsum (alabaster). Small tracts of Quinlan and Cottonwood soils are in this area of Rough broken land. (Dryland capability unit VIIs-2; Rough Breaks range site)

Spur Series

The Spur series consists of nearly level, deep, well-drained soils. These soils are on infrequently flooded bottom lands of the major creeks and drainageways. They developed from calcareous alluvial sediments. The vegetation under which they developed consisted of tall and mid grasses.

The surface layer of a typical Spur soil is about 18 inches of brown and dark-brown, friable, calcareous, mildly alkaline fine sandy loam and clay loam. Between a depth of 18 and 40 inches, the material is brown, crumbly and porous, calcareous, moderately alkaline light clay loam. The underlying material is reddish-brown, loose, calcareous, moderately alkaline fine sandy loam stratified with loamy fine sand.

Typical profile of Spur fine sandy loam in a cultivated field 100 feet north of a county road, at a point 0.7 mile east and 1.0 mile south of Dry Lake.

Ap—0 to 8 inches, brown (7.5YR 5/3) fine sandy loam, dark brown (7.5YR 3/3) when moist; structureless; soft when dry, friable when moist; calcareous and mildly alkaline; abrupt boundary.

A1—8 to 18 inches, dark-brown (7.5YR 4/2) light clay loam, dark brown (7.5YR 3/2) when moist; moderate, medium, granular structure; hard when dry, friable when moist; about 20 percent worm casts and 5 percent very fine and fine pores; calcareous and mildly alkaline; gradual boundary.

AC—18 to 40 inches, brown (7.5YR 4/4) light clay loam, dark brown (7.5YR 3/4) when moist; moderate, medium, granular structure; hard when dry, friable when moist; about 10 percent worm casts and 2 percent very fine and fine pores; calcareous and moderately alkaline; gradual boundary.

C—40 to 64 inches +, reddish-brown (5YR 5/4), stratified fine sandy loam and loamy fine sand, reddish brown (5YR 4/4) when moist; structureless; soft when dry, loose when moist; thin lenses of loamy fine sand; calcareous and moderately alkaline.

When dry, the A horizon ranges from brown to dark grayish brown in hues of 7.5YR to 10YR. It ranges from 5 to 26 inches in thickness and from fine sandy loam to clay loam in texture. The structure ranges from weak to moderate in distinctness, from fine to medium in size, and from granular to subangular blocky in shape. In places the Ap horizon is structureless. The AC horizon, when dry, ranges from reddish

Figure 11.—**Rough broken land in the Croton Breaks.**

brown to dark grayish brown in hues of 5YR to 10YR. It ranges from loam to clay loam or sandy clay loam in texture and from 15 to 30 inches in thickness. The C horizon ranges from stratified fine sandy loam and loamy fine sand to clay.

Spur soils are darker colored to a greater depth than Berda soils and are more stratified than Bippus soils. Spur soils are underlain by less clayey and more friable material than Abilene soils.

Spur clay loam (Sp).—This soil occurs mainly on the broad flood plains of Duck Creek and Dockum Creek, in the south-central part of the county. The areas are irregular in shape and less than 200 acres in size. The slope is dominantly less than 0.5 percent.

The profile is similar to the one described for the series, but the surface layer is about 25 inches of dark-brown, friable, calcareous, alkaline clay loam. Between a depth of 25 and about 48 inches, the material is brown, friable, porous, alkaline, calcareous clay loam. The underlying material consists of brown, massive, alkaline, calcareous fine sandy loam.

Included with this soil in mapping were small areas of Abilene and Miles soils and areas that have a slope greater than 1 percent.

This Spur soil is high in natural fertility and is easy to till. Most of it is cultivated. Soil blowing is only a slight hazard. (Dryland capability unit IIce-1; irrigated capability unit I-1; Loamy Bottomland range site)

Spur fine sandy loam (Sr).—This soil has the profile described as typical of the Spur series. It occurs mainly on the broad flood plains of Duck Creek and Dockum Creek, in the south-central part of the county. The areas are irregular in shape and mostly between 100 and 300 acres in size. The slope is dominantly about 0.5 percent.

Included with this soil in mapping were small areas of Meno and Abilene soils, totaling about 10 percent of the acreage; areas of loamy fine sand; and areas that have a slope greater than 1 percent.

This Spur soil is high in natural fertility and is easy to till. Most of it is cultivated. Soil blowing is a moderate hazard. (Dryland capability unit IIIe-3; irrigated capability unit I-2; Loamy Bottomland range site)

Stamford Series

The Stamford series consists of gently sloping and concave, very slowly permeable, clayey soils of the uplands in the western part of the county. These soils developed in calcareous clay weathered from red beds. They crack to a depth of 20 inches or more during dry periods. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Stamford soil is about

8 inches of brown, extremely firm, calcareous clay of subangular blocky and blocky structure. Between a depth of 8 and 34 inches, the material is similar but has blocky structure. The underlying material is red, calcareous clay.

Typical profile of Stamford clay, 1 to 3 percent slopes, in a native pasture 150 feet west of a county road, at a point 1.3 miles south and 2.6 miles west of the intersection of Farm Roads 2565 and 836.

A1—0 to 8 inches, brown (7.5YR 5/3) clay, very dark brown (7.5YR 3/3) when moist; compound structure—moderate, medium, subangular blocky and moderate, fine and medium, blocky; extremely hard when dry, extremely firm when moist; about 2 percent worm casts and 2 percent fine to medium pores; calcareous and moderately alkaline; gradual boundary.

AC—8 to 34 inches, brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) when moist; moderate, fine and medium, blocky structure; extremely hard when dry, extremely firm when moist; many slickensides; about 1 percent fine pores and lower part about 5 percent very fine concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

C—34 to 60 inches +, red (2.5YR 5/6) clay, red (2.5YR 4/6) when moist; massive; extremely hard when dry, extremely firm when moist; about 20 percent bluish mottles; calcareous and moderately alkaline.

When dry, the A horizon ranges from reddish brown to brown in hues of 5YR to 7.5YR, values of 4 to 5, and chromas of 3 to 4. The thickness ranges from 6 to 12 inches. The AC horizon, when dry, ranges from red to reddish brown or brown in hues of 2.5YR to 7.5YR, values of 4 to 5, and chromas of 3 to 6. The thickness ranges from 20 to 36 inches.

Stamford soils have a thicker solum than Vernon soils and a more clayey surface layer than Tillman soils. Stamford soils are more clayey and more compact than Weymouth soils.

Stamford clay, 1 to 3 percent slopes (StB).—This soil has the profile described as typical of the Stamford series. It occurs as smooth, slightly concave areas in the western part of the county, mainly on the grounds of the Texas Agricultural Experiment Station. The slope most commonly is about 1.5 percent.

Included with this soil in mapping were areas of Tillman, Vernon, and Weymouth soils, totaling slightly less than 40 percent of the acreage; and, on the lower slopes, areas that are darker colored and grayer than typical.

This Stamford soil is difficult to till and to form into a good seedbed. Droughtiness is a limitation. Soil blowing and water erosion are slight hazards. Most areas are used as range. The native vegetation consists mainly of buffalograss, blue grama, and side-oats grama. (Dryland capability unit IVe-5; Clay Flats range site)

Tillman Series

The Tillman series consists of convex, nearly level to gently sloping, deep, very slowly permeable, well-drained soils of the uplands. These soils are mostly west and southwest of Spur. They developed from moderately fine textured, calcareous sediments. When dry, they crack to a depth of 20 inches or more. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Tillman soil is about 6 inches of reddish-brown, friable, mildly alkaline clay loam. Between a depth of 6 and 41 inches, the material is reddish, blocky, firm and very firm, calcareous clay. Below a depth of 41 inches is reddish-yellow to yellowish-red, firm to friable, calcareous silty clay loam. Many lime pebbles occur in the upper part.

Typical profile of Tillman clay loam, 1 to 3 percent slopes, in a cultivated field 50 feet north and 200 feet west of the headquarters building on the Texas Agricultural Experiment Station.

Ap—0 to 6 inches, reddish-brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) when moist; weak granular structure; hard when dry, friable when moist; noncalcareous and mildly alkaline; abrupt, smooth boundary.

B1—6 to 10 inches, reddish-brown (5YR 4/3) light clay, dark reddish brown (5YR 3/3) when moist; compound structure—moderate, medium, blocky and moderate, medium, subangular blocky; very hard when dry, firm when moist; less than 1 percent very fine concretions of calcium carbonate; calcareous and moderately alkaline; gradual, smooth boundary.

B21t—10 to 28 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) when moist; moderate, medium, blocky structure; extremely hard when dry, very firm when moist; about 2 percent medium and fine concretions of calcium carbonate; calcareous and moderately alkaline; gradual boundary.

B22t—28 to 41 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) when moist; weak, medium, blocky structure; extremely hard when dry, very firm when moist; about 2 percent soft masses and concretions of calcium carbonate; calcareous and moderately alkaline; clear boundary.

B3ca—41 to 50 inches, reddish-yellow (5YR 7/6) silty clay loam, slightly darker reddish yellow (5YR 6/6) when moist; weak, medium, blocky structure to massive; hard when dry, friable when moist; about 20 percent segregations of calcium carbonate; calcareous and moderately alkaline; diffuse boundary.

C—50 to 63 inches +, yellowish-red (5YR 6/6) silty clay loam, yellowish red (5YR 5/6) when moist; hard when dry, firm when moist; about 5 percent segregations of calcium carbonate; calcareous and moderately alkaline; appears to be outwash material.

When dry, the A horizon ranges from brown to reddish brown in hues of 5YR to 7.5YR. The thickness ranges from 4 to 9 inches. The B1 and B2 horizons, when dry, range from reddish brown to yellowish red or red in hues of 2.5YR to 5YR, values of 3 to 5, and chromas of 3 to 6. They range from heavy clay loam to clay in texture and from 20 to 60 inches in thickness. The B3ca horizon, when dry, ranges from yellowish red to pink in hues of 2.5YR to 7.5YR. The texture ranges from clay loam to light clay. The content of calcium carbonate ranges from 15 to 40 percent. The depth to the B3ca horizon ranges from 24 to 70 inches.

Tillman soils are redder than Abilene soils and typically are less deep to the B2 horizon. They are deeper and less limy than Weymouth soils and have less blocky structure in the subsoil.

Tillman clay loam, 0 to 1 percent slopes (TlA).—This soil occurs mostly on smooth uplands west of Spur. The areas are irregular in shape and several hundred acres in size. The slope is dominantly about 0.5 percent.

The profile is similar to the one described for the series, but the surface layer is about 8 inches thick and the depth to silty clay loam is about 44 inches.

Included with this soil in mapping were areas of Abilene and Olton soils less than 5 acres in size and areas that are limy throughout.

Most of this Tillman soil is cultivated to cotton, sorghum, and small grain. It is high in natural fertility and high in available water capacity. Tillage is easy, but a thin, hard crust forms on the surface after rains. Cracks form to a depth of 20 inches or more during dry periods. Soil blowing is a slight hazard. Droughtiness is more

severe than for the sandy soils in the county. Light rains penetrate less deeply, and more water runs off during heavy rains. Thus, less moisture is available to plants. (Dryland capability unit IIIs-1; irrigated capability unit IIs-1; Deep Hardland range site)

Tillman clay loam, 1 to 3 percent slopes (TlB).—This soil has the profile described as typical of the Tillman series. It is mostly west of Spur. The areas are irregular in shape and generally less than 200 acres in size. The slope is dominantly about 1.5 percent.

Included with this soil in mapping were areas of Olton, Stamford, and Weymouth soils less than 5 acres in size and local areas that are limy throughout.

Most of this Tillman soil is cultivated to cotton, sorghum, and small grain. Natural fertility is high. The available water capacity also is high, but droughtiness is a limitation. Cracks form to a depth of 20 inches or more during dry periods. Tillage is easy, but a thin, hard crust forms on the surface after rains. Soil blowing and water erosion are only slight hazards. (Dryland capability unit IIIe-6; irrigated capability unit IIIe-6; Deep Hardland range site)

Veal Series

The Veal series consists of convex, gently sloping to moderately sloping, light-colored, moderately permeable soils that are shallow to caliche. These soils are on uplands and are mainly in the northwestern part of the county. They developed in calcareous sediments. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Veal soil is about 7 inches of brown, crumbly and porous, calcareous fine sandy loam. The subsoil, which extends to a depth of 16 inches, is brown, crumbly and porous, calcareous sandy clay loam. It contains a few lime pebbles. The underlying material is light-brown, friable, calcareous sandy clay loam or caliche. In it are numerous lime pebbles.

Typical profile of Veal fine sandy loam, 3 to 5 percent slopes, in a native pasture 0.7 miles southeast of intersecting county roads; this intersection is 2.25 miles south and 1.0 mile east of the intersection of State Route 70 and Farm Road 261.

A1—0 to 7 inches, brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 4/2) when moist; compound structure—moderate, medium, granular and weak subangular blocky; slightly hard when dry, friable when moist; about 15 percent worm casts; calcareous; gradual boundary.

B2—7 to 16 inches, brown (7.5YR 5/2) sandy clay loam, dark brown (7.5YR 4/2) when moist; compound structure—moderate, medium, granular and moderate, coarse, prismatic; hard when dry, friable when moist; about 35 percent worm casts and 10 percent concretions of calcium carbonate; calcareous; diffuse boundary.

C1ca—16 to 30 inches, light-brown (7.5YR 6/4) light sandy clay loam, brown (7.5YR 5/4) when moist; massive; hard when dry, friable when moist; about 30 percent calcium carbonate; diffuse boundary.

C2—30 to 48 inches +, light-brown (7.5YR 6/4) light sandy clay loam, brown (7.5YR 5/4) when moist; about 10 percent calcium carbonate.

When dry, the A horizon ranges from brown to light brownish gray in hues of 7.5YR to 10YR, values of 5 to 6, and chromas of 2 to 4. It ranges from loam to fine sandy loam in texture and from 4 to 10 inches in thickness. The B2 horizon, when dry, is similar in color to the A horizon, but occasionally the value is one unit higher. The texture ranges from loam to sandy clay loam, and the thickness ranges from 6 to 12 inches. The structure generally is moderate in distinctness, but it ranges from fine to medium in size and from granular to subangular blocky in shape. In some places it is medium to coarse prismatic. The depth to the C1ca horizon ranges from 10 to 22 inches. Segregated concretions and soft lumps of calcium carbonate make up 15 to 50 percent of the C1ca horizon.

Veal soils have a lighter colored surface layer than Mansker soils. Veal soils differ from Berda soils in having horizons of calcium carbonate accumulation.

Veal fine sandy loam, 1 to 3 percent slopes (VeB).—This soil occurs as convex areas scattered throughout the county but is mainly in the northwestern part. The areas generally are oval in shape and less than 50 acres in size. The slope is dominantly about 2 percent.

The profile is similar to the one described for the Veal series, but the surface layer typically is about 8 inches thick and the subsoil extends to a depth of 17 inches.

Included with this soil in mapping were small bodies of Miles soils. Included near the caprock escarpment were areas of Berda, Mobeetie, and Potter soils, totaling about 10 percent of the acreage.

This Veal soil is easy to till and responds readily to management, but most areas are used as range. The native vegetation consists mainly of short and mid grasses and small scattered mesquite trees. Soil blowing is only a slight hazard, but water erosion has cut a few small gullies in some areas. (Dryland capability unit IIIe-5; irrigated capability unit IIIe-5; Sandy Loam range site)

Veal fine sandy loam, 3 to 5 percent slopes (VeC).—This soil has the profile described as typical of the Veal series. It occurs as convex areas and is mostly in the northwestern part of the county. These areas are irregularly oval in shape and generally less than 40 acres in size. The slope is dominantly about 4 percent.

Included with this soil in mapping were small bodies of Miles, Potter, and Mobeetie soils; a few small areas that have a slope greater than 5 percent; and small spots at the crests of the ridges and knolls that contain fine to coarse gravel.

Slightly more than two-thirds of this Veal soil is in range. The native vegetation consists mainly of short and mid grasses and small, scattered mesquite trees. A few areas are in sorghum and small grain, but cultivated crops generally are not well suited. Soil blowing is a moderate hazard, and water erosion is a moderate to severe hazard. In some cultivated areas, sheet erosion has removed 2 to 3 inches of the surface layer and gullies 1 foot deep and up to 6 feet wide occur at intervals of 100 to 300 feet. (Dryland capability unit IVe-3; Sandy Loam range site)

Vernon Series

The Vernon series consists of undulating to rolling, clayey soils. These soils are on uplands and are mostly in the southwestern part of the county. They developed in calcareous clay and shale weathered from red beds. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Vernon soil is about 7 inches of reddish-brown, blocky, very firm, calcareous clay loam. Between depths of 7 and 15 inches, the material is red, blocky to massive, extremely firm, calcareous clay. The underlying material is red clay stratified with clayey and shaley red-bed material.

Typical profile of a Vernon clay loam (fig. 12) in a native pasture about 1.0 mile east and 0.5 mile north of the headquarters of the Spur Headquarters Ranch.

A1—0 to 7 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) when moist; moderate, fine, blocky structure; very hard when dry, very firm when moist; calcareous and moderately alkaline; diffuse boundary.

AC—7 to 15 inches, red (2.5YR 4/6) clay, dark red (2.5YR 3/6) when moist; weak blocky structure to massive (structureless); extremely hard when dry, extremely firm when moist; scattered, fine, nodular concretions of calcium carbonate; calcareous and moderately alkaline; diffuse boundary.

C—15 to 60 inches +, red (2.5YR 4/6) clay, dark red (2.5YR 3/6) when moist; stratified, clayey and shaley red-bed material with seams and pockets of greenish, bluish, and grayish clay.

When dry, the A horizon ranges from red to reddish brown or brown in hues of 2.5YR to 7.5YR, values of 4 to 5, and chromas of 2 to 5. It ranges from clay loam to clay in texture and from 4 to 9 inches in thickness. This horizon is massive or has moderate, fine to medium, blocky structure. The AC horizon, when dry, ranges from red to strong brown in hues of 2.5YR to 7.5YR. The texture ranges from heavy clay loam to clay, and the thickness ranges from 2 to 15 inches. This horizon is massive or has moderate, medium, blocky structure. The depth to the C horizon ranges from 12 to 22 inches.

Vernon soils have a thinner solum than Stamford soils. Vernon soils are more clayey than Quinlan and Weymouth soils and are less porous and less friable than Weymouth soils.

Vernon soils, 3 to 8 percent slopes (VnD).—These soils are on ridges and knolls and on the side slopes of small drainageways. The slope is dominantly about 4 percent.

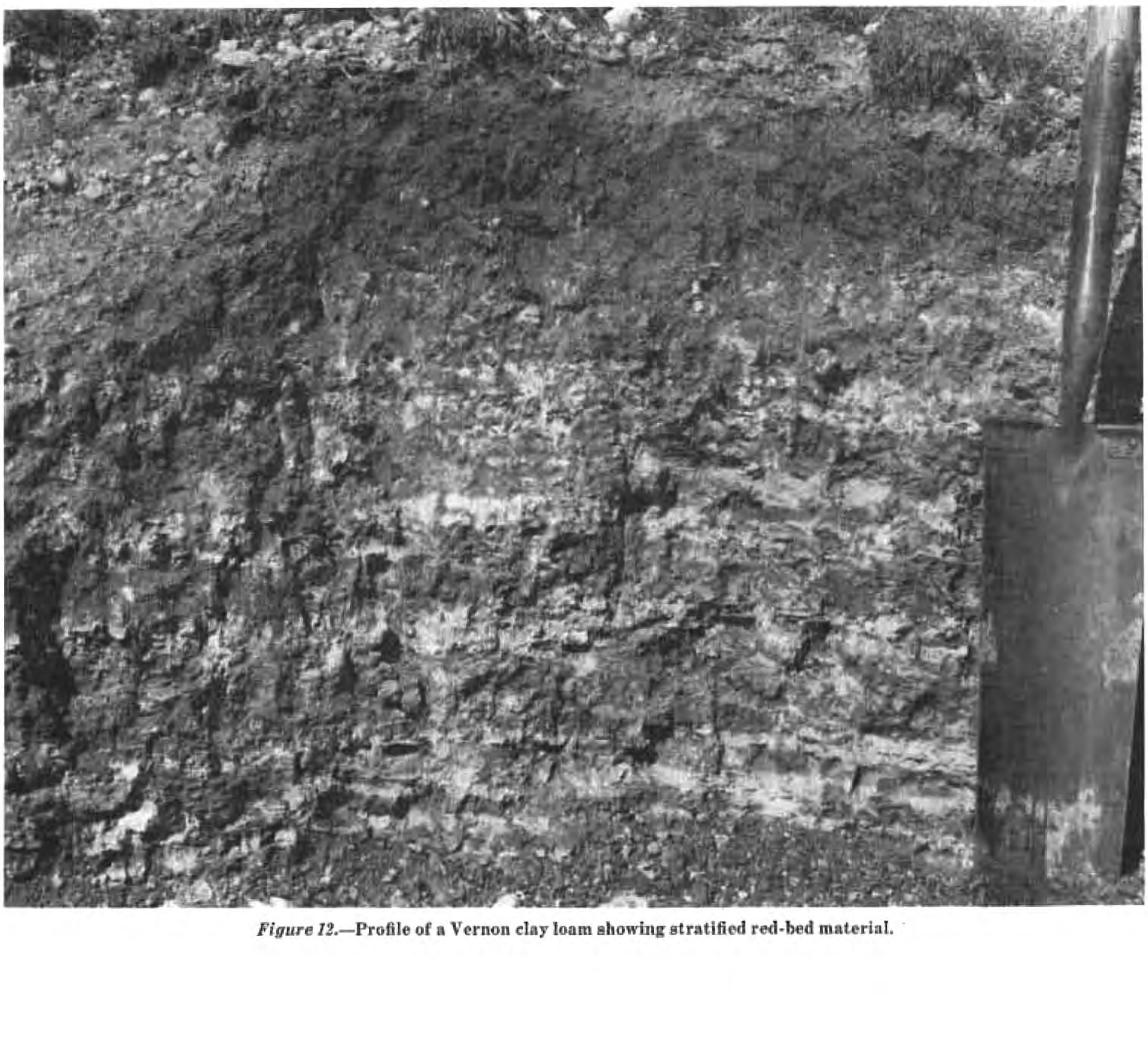

Figure 12.—**Profile of a Vernon clay loam showing stratified red-bed material.**

The profile of these soils is like that described for the Vernon series, except that the surface layer ranges from clay loam to clay.

Included with these soils in mapping were areas of Weymouth soils, totaling about 10 percent of the acreage in some places, and small areas of Latom, Olton, and Miles soils.

These Vernon soils are poorly suited to cultivation because they are shallow, absorb water slowly, and are highly susceptible to water erosion. Most areas are used as range. The native vegetation consists mostly of short grasses. (Dryland capability unit VIe-4; Shallow Redland range site)

Vernon-Badland complex, hilly (Vr).—This complex is on ridges and on the side slopes of small drainageways. The areas generally are irregular in shape and less than 100 acres in size. They are dissected by numerous small drainageways that carry water swiftly into larger drainageways and creeks. The slope is dominantly about 12 percent.

About 41 percent of this complex is Vernon clay, 36 percent is Badland, 12 percent is Stamford clay, and 11 percent is Vernon clay loam. Vernon soils make up 25 to 75 percent of each delineation on the map, and Badland makes up 25 to 50 percent. Included with the complex in mapping were small areas of Latom, Stamford, and Weymouth soils and a few places about 25 percent covered with quartzitic pebbles.

Vernon soils are in the smoother, grass-covered spots. The surface layer typically is about 6 inches of reddish-brown, blocky, friable, calcareous clay. The next 7 inches is red, blocky, extremely firm, calcareous clay. The underlying material consists of clayey redbed sediments. Badland occurs as rough, broken, bare areas.

This complex is not suitable for cultivation, because the slopes are steep, gullies are numerous, and erosion is a persistent hazard. Better uses are wildlife habitat and grazing. (Vernon soils—dryland capability unit VIe-4, Shallow Redland range site; Badland—dryland capability unit VIIIs-1, included with the adjoining range sites)

Weymouth Series

The Weymouth series consists of convex, gently sloping to moderately sloping, moderately permeable soils. These soils are on uplands and are mostly in the southern half of the county. They are calcareous soils that are shallow to caliche. They developed in calcareous clay and shale weathered from red beds. The vegetation under which they developed consisted of short grasses.

The surface layer of a typical Weymouth soil is about 8 inches of reddish-brown, friable, porous, calcareous clay loam. The subsoil, which extends to a depth of 26 inches, is reddish-brown to red, crumbly and porous, calcareous clay loam. There are many lime pebbles below a depth of 14 inches. The underlying material is loam that is slightly altered red-bed material.

Typical profile of Weymouth clay loam, 1 to 3 percent slopes, in a cultivated field 200 feet west of a county road and 1.4 miles north of Gilpin.

Ap—0 to 8 inches, reddish-brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/4) when moist; weak granular structure; hard when dry, friable when moist; calcareous and moderately alkaline; abrupt boundary.

B2—8 to 14 inches, reddish-brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/4) when moist; compound structure—weak, coarse, prismatic and weak, fine, subangular blocky; hard when dry, friable when moist; calcareous and moderately alkaline; clear boundary.

B3ca—14 to 26 inches, red (2.5YR 5/6) clay loam, darker red (2.5YR 4/6) when moist; weak, coarse, prismatic structure; hard when dry, friable when moist; about 30 percent calcium carbonate concretions and 25 percent worm casts; calcareous and moderately alkaline; diffuse boundary.

C—26 to 36 inches +, red (2.5YR 5/6) loam, darker red (2.5YR 4/6) when moist; hard when dry, friable when moist; represents slightly altered and weakly consolidated Permian sediments.

When dry, the Ap horizon ranges from brown to reddish brown in hues of 5YR to 7.5YR. It ranges from 5 to 12 inches in thickness. In undisturbed areas the uppermost 6 inches is an A11 horizon of weak to moderate, fine to medium, granular or subangular blocky structure. The B2 horizon, when dry, ranges from reddish brown to light reddish brown in hues of 2.5YR to 5YR. The structure is either weak to moderate, fine to medium, granular to subangular blocky or medium to coarse prismatic. The B3ca horizon is weak to strong in distinctness. It occurs at a depth of 14 to 24 inches and is 8 to 18 inches thick.

Weymouth soils have a thinner and more friable solum than Olton soils, which are noncalcareous. Weymouth soils are less clayey and more friable than Vernon soils.

Weymouth clay loam, 1 to 3 percent slopes (WeB).—This soil has the profile described as typical of the Weymouth series. It occurs on slightly convex knolls and ridges, mostly in the southern part of the county. The areas generally are oval in shape and less than 50 acres in size. The slope is dominantly about 2 percent.

Included with this soil in mapping were areas of loam, totaling about 10 percent of the acreage, and small areas of Olton, Vernon, and Woodward soils.

This Weymouth soil is used mostly as range, but some is cultivated. The main cultivated crops are cotton, sorghum, and small grain. Soil blowing and water erosion are slight hazards. In some areas water erosion has cut a few gullies about 1 foot deep and 8 to 15 feet wide at intervals of 200 to 500 feet. (Dryland capability unit IIIe-4; irrigated capability unit IIIe-4; Shallow Redland range site)

Weymouth clay loam, 3 to 5 percent slopes (WeC).—This soil is on convex knolls and ridges, mostly in the southwestern part of the county. The areas generally are oval in shape and less than 30 acres in size. The slope is dominantly about 3.5 percent.

The profile is similar to the one described for the series, but the surface layer is only about 7 inches thick and the subsoil extends to a depth of about 24 inches.

Included with this soil in mapping were areas of Olton and Vernon soils, totaling about 13 percent of the acreage, and a few small areas that have a loam surface layer about 8 inches thick.

Most of this Weymouth soil is used as range, but some is cultivated to sorghum and small grain. Soil blowing is a slight hazard, and water erosion is a moderate hazard. Gullies 6 to 18 inches deep and up to 20 feet across occur occasionally at intervals of 200 to 400 feet. (Dryland capability unit IVe-1; Shallow Redland range site)

Woodward Series

The Woodward series consists of gently sloping to sloping, moderately permeable soils. These soils are on uplands in the eastern part of the county. They are moderately deep over calcareous, soft sandstone or packsand in which these soils have developed. The vegetation under which they developed consisted of short and mid grasses.

The surface layer of a typical Woodward soil is about 8 inches of reddish-brown, crumbly and porous, calcareous loam. The subsoil, which extends to a depth of 20 inches, is red, friable, crumbly and porous, calcareous loam. The underlying material consists of light-red, prismatic, calcareous loam over red, partly weathered and weakly consolidated sandstone. Numerous lime pebbles occur in the upper part.

Typical profile of Woodward loam, 3 to 5 percent slopes, in a native pasture 150 feet south of U.S. Highway No. 82, at a point 1.5 miles west of the bridge across the South Wichita River.

A1—0 to 8 inches, reddish-brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) when moist; compound structure—weak, coarse, prismatic and weak granular; hard when dry, very friable when moist; about 20 percent worm casts and a few fine pores; weakly calcareous and mildly alkaline; clear boundary.

B2—8 to 20 inches, red (2.5YR 4/6) loam, dark red (2.5YR 3/6) when moist; compound structure—weak, coarse, prismatic and weak granular; very hard when dry, friable when moist; about 25 percent worm casts and discontinuous films and threads of calcium carbonate on surface and through peds; calcareous and moderately alkaline; gradual boundary.

C1ca—20 to 26 inches, light-red (2.5YR 6/6) loam, red (2.5YR 4/6) when moist; weak, coarse, prismatic structure; very hard when dry, friable when moist; about 20 percent soft masses and concretions of calcium carbonate and 25 percent worm casts; calcareous and moderately alkaline; gradual boundary.

C2—26 to 36 inches +, red (2.5YR 5/8), partly weathered and weakly consolidated Permian sandstone.

When dry, the A1 horizon ranges from reddish brown to brown in hues of 2.5YR to 7.5YR, values of 4 to 5, and chromas of 3 to 6. This horizon ranges from loam to silt loam and very fine sandy loam in texture and from 5 to 12 inches in thickness. The B2 horizon, when dry, ranges from reddish brown to red or yellowish red in hues of 2.5YR to 5YR, values of 3 to 6, and chromas of 3 to 6. The texture ranges from very fine sandy loam to light clay loam or light sandy clay loam. The sand fraction is dominantly very fine sand. The structure ranges from weak granular to moderate, fine and medium, subangular blocky. The C1ca horizon, when dry, ranges from red to yellowish red in hues of 2.5YR to 5YR. This horizon is lacking in some places.

Woodward soils are deeper than Quinlan soils, which lack a Cca horizon. Woodward soils are shallower and more calcareous than Carey soils.

Woodward loam, 1 to 3 percent slopes (WoB).—This soil occurs on ridges and knolls, mostly in the southeastern part of the county. The areas are irregular in shape and mostly between 20 and 100 acres in size. The dominant slope is about 2 percent.

The profile is similar to the one described for the series, but the subsoil extends to a depth of 23 inches.

Included with this soil in mapping were areas of Quinlan and Weymouth soils, totaling about 10 percent of the acreage, and small areas of Cottonwood soils.

This Woodward soil is medium in fertility and has moderate available water capacity. Most of it is used as range, but some is cultivated to cotton, sorgh small grain. Soil blowing and water erosion a hazards. Terraces are needed to help control w sion. (Dryland capability unit IIe-1; irrigated ity unit IIe-1; Mixedland range site)

Woodward loam, 3 to 5 percent slopes (WoC soil has the profile described as typical of the W series. It is on ridges and on side slopes of drain mostly in the eastern half of the county. The a irregular in shape and mostly less than 100 acre The slope is most commonly a little less than 4

Included with this soil in mapping were Quinlan soils, totaling about 10 percent of the and areas of clay loam, silt loam, or very fine san less than 5 acres in size.

Most of this Woodward soil is used as range, l is cultivated to sorghum and small grain. So ing is a slight hazard, and water erosion is a n hazard. Terraces are needed to help control wa sion. Crop residue left on or near the surface reduce both water erosion and blowing. (Drylar bility unit IIIe-2; irrigated capability unit Mixedland range site)

Woodward-Quinlan loams, 3 to 15 percent (WuE.)—This complex occurs in irregularly shape ranging from 30 to more than 1,000 acres in si chiefly in smooth, rolling areas of the Croton Woodward soils are on the sides of ridges and and Quinlan soils are on the crests. The domina is about 5 percent.

The Woodward and Quinlan soils have a profi lar to the one described as typical of the Woodw Quinlan series, respectively. Both Woodward an lan soils occur in each delineation on the map, percentage of each varies. On the average, most tions contain 31 percent Woodward very fine loam, 14 percent Woodward loam, 13 percent very fine sandy loam, 11 percent Quinlan loam, cent Carey very fine sandy loam and loam, 4 Olton clay loam, 3 percent soils similar to Quinl but less than 10 inches deep, 2 percent Cottonwoo 3 percent Vernon clay loam, and 1 percent soils to Vernon soils but less than 6 inches deep. In inc areas the percentage of Woodward soils is betw and 75 and of Quinlan soils between 20 and other soils occur in 5 to 25 percent of the small tions and make up local areas within larger delin

Included with this complex in mapping wer areas of Quinlan-Cottonwood complex, and of Alluvial land complex.

The soils of this complex are poorly suited to tion because the slopes are steep and much of th age is shallow. Better uses are grazing and wildli tat. (Dryland capability unit VIe-3; Mixedlanc site)

Yahola Series

The Yahola series consists of nearly level, deep, ately permeable, well-drained soils. These soil on infrequently flooded bottom lands along Croton and its tributaries. They developed in calcareo alkaline alluvial sediments. The vegetation under they developed consisted of tall and mid grasses.

The surface layer of a typical Yahola soil is about 15 inches of light reddish-brown, very friable, porous, calcareous very fine sandy loam. The underlying material consists of several feet of light reddish-brown very fine sandy loam stratified with silt loam, fine sandy loam, and fine sand.

Typical profile of Yahola very fine sandy loam in a native pasture 0.1 mile east and 0.2 mile south of the junction of Little Croton Creek and Croton Creek.

A1—0 to 15 inches, light reddish-brown (5YR 6/4) very fine sandy loam, reddish brown (5YR 4/4) when moist; weak granular structure; slightly hard when dry, very friable when moist; about 5 percent worm casts and 2 percent fine pores; calcareous and moderately alkaline; diffuse boundary.

C—15 to 60 inches +, light reddish-brown (5YR 6/4) very fine sandy loam stratified with 2- to 20-millimeter lenses of silt loam, fine sandy loam, and fine sand; reddish brown (5YR 5/4) when moist; calcareous and moderately alkaline.

When dry, the A horizon ranges from light reddish brown to reddish yellow or red in hues of 2.5YR to 5YR, values of 5 to 6, and chromas of 4 to 6. The thickness ranges from 6 to 24 inches. The C horizon has the same color range as the A horizon. The dominant and average texture is medium, but the thin lenses are fine, moderately coarse, and coarse in texture.

Yahola soils are lighter colored and redder than Spur soils and are underlain by less clayey material. Yahola soils are redder and less sandy than Lincoln soils.

Yahola very fine sandy loam (Yo).—This soil has the profile described as typical of the Yahola series. It occurs mostly along the flood plains of Croton Creek and its tributaries, in the eastern part of the county. The slope is dominantly 0.5 percent or less.

Included with this soil in mapping were small areas of Lincoln and Spur soils and moderately salty areas generally less than 5 acres in size.

This Yahola soil is productive and easy to till. Nevertheless, most of it is used as range. Soil blowing is a slight hazard. Crop-residue use and fertilization are needed to help control erosion and to maintain fertility. (Dryland capability unit IIce-2; irrigated capability unit I-2; Loamy Bottomland range site)

Use and Management of the Soils

This section concerns the use and management of the soils of the county as cropland, as range, as wildlife habitat, and in engineering works.

Capability Classification

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment when they are used for the common field crops and pasture plants. The classification does not apply to most horticultural crops or to rice and other crops that have special requirements. The soils are classified according to degree and kind of permanent limitation but without considering major and generally expensive alterations that could be made in the slope, depth, or other characteristics of the soils, and without considering possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV. Soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V. Soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife food and cover.

Class VIII. Soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c* shows that the chief limitation is climate that is too cold or too dry. For some soils, climate and one of the other kinds of limitations have about equal importance, and the subclass symbol shows both kinds IIce is an example.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use.

CAPABILITY UNITS are soil groups within the subclasses. All the soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to be similar in productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many state-

ments about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 (Irrigated) or IIce-2 (Dryland). Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

Capability unit numbers generally are assigned locally but are part of a statewide system. Not all of the irrigated units in the system are represented by the soils of Dickens County; therefore, the numbers are not consecutive.

Both dryland farming and irrigated farming are practiced in Dickens County, and each capability unit is designated as either dryland or irrigated. Soils that are farmed partly as dryland and partly under irrigation are in two capability units. Miles fine sandy loam, 1 to 3 percent slopes, for example, is in capability unit IIIe-3 dryland and IIe-4 irrigated.

Management of dryland soils, by capability units

In the following pages the capability units for dryland soils in Dickens County are described and suggestions for use and management are discussed.

To find the capability classification of any given mapping unit, refer to the "Guide to Mapping Units."

CAPABILITY UNIT IIe-1 (DRYLAND)

This unit consists of gently sloping, moderately deep to deep, reddish-brown soils on uplands. The surface layer is loam or very fine sandy loam, and the underlying material is loam, sandy clay loam, or very fine sandy loam. Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Natural fertility is high. Water erosion and soil blowing are slight hazards.

The soils in this unit are suited to cultivation, but most areas are within large ranches and are used as range. The chief cultivated crops are cotton, sorghum, and small grain. Suitable for pasture are side-oats grama, blue grama, and johnsongrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. It is beneficial to apply a mulch of cotton burs or other residue occasionally or to grow a winter cover crop occasionally. Crop residue left on or near the surface after harvest helps to prevent surface crusting and to control soil blowing. If the crop does not leave enough residue for control of blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to control water erosion.

CAPABILITY UNIT IIce-1 (DRYLAND)

This unit consists of nearly level, deep, dark-colored, limy soils. The surface layer is loam or clay loam, and the underlying material is porous, friable clay loam. Permeability is moderate, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard.

The soils in this unit are well suited to cultivation and are cultivated extensively. Cotton is the main cash crop, but grain sorghum, forage sorghum, and small grain are grown also. Suitable for pasture are side-oats grama, switchgrass, and johnsongrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop grown in rotation with sorghum, small grain, or some other high-residue crop. It is beneficial to apply a mulch of cotton burs or other residue occasionally or to grow a winter cover crop occasionally. Crop residue left on or near the surface after harvest helps to prevent surface crusting and to control soil blowing. If the crop does not leave enough residue for control of blowing, chiseling and listing are effective as emergency measures. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIce-2 (DRYLAND)

Yahola very fine sandy loam is the only soil in this unit. It is a nearly level, deep, light reddish-brown, limy soil on bottom lands. Both the surface layer and underlying material are very fine sandy loam. Permeability is moderately rapid, and the available moisture capacity is moderate. Natural fertility is medium. Both soil blowing and water erosion are slight hazards.

This soil is suited to cultivation, but most areas occur within large ranches and are used as range. Grain sorghum and forage sorghum are the main crops. Suitable for pasture are switchgrass, side-oats grama, and johnsongrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. It is beneficial to apply a mulch of cotton burs or other residue occasionally or to grow a winter cover face after harvest helps to control soil blowing. If the crop occasionally. Crop residue left on or near the surcrop does not leave enough residue, chiseling and listing are effective as emergency measures.

CAPABILITY UNIT IIce-3 (DRYLAND)

This unit consists of nearly level, deep, dark-colored soils on bottom lands and on slightly concave uplands. The surface layer is clay loam, and the underlying material is blocky or massive clay loam or clay. Permeability is slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard.

The soils in this unit are well suited to cultivation and are cultivated extensively. Cotton is the main cash crop, but sorghum and small grain also are grown. Suitable for pasture are side-oats grama, blue grama, and johnsongrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. It is beneficial to apply a mulch of cotton burs or other residue occasionally or to grow a winter cover crop occasionally. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling or listing are effective as emergency measures. Terracing and contour farming help to conserve moisture. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIIe-1 (DRYLAND)

This unit consists of gently sloping, deep, dark-colored soils on uplands. The surface layer is clay loam, and the underlying material is clay loam or clay. Permeability is moderate to slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

The soils in this unit are suited to cultivation, but more of the acreage is used for range than for cultivated crops. Cotton, sorghum, and small grain are the main cultivated crops. Suitable for pasture are side-oats grama, blue grama, and johnsongrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. It is beneficial to apply a mulch of cotton burs or other residue occasionally or to grow a winter cover crop occasionally. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIIe-2 (DRYLAND)

This unit consists of moderately sloping, moderately deep to deep, reddish-brown soils on uplands. The surface layer is loam or very fine sandy loam, and the underlying material is loam, very fine sandy loam, or sandy clay loam. Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Natural fertility is high. Soil blowing is a slight hazard, and water eroson is a moderate hazard.

The soils in this unit are suited to cultivation, but most areas are within large ranches and are used as range. The chief cultivated crops are sorghum and small grain. Suitable for pasture are side-oats grama, blue grama, and johnsongrass. Vetch, guar, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. A winter cover crop or a mulch of cotton burs or other residue should be used frequently. Crop residue left on or near the surface after harvest helps to control water erosion and soil blowing. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIIe-3 (DRYLAND)

This unit consists of nearly level to gently sloping, deep, brownish soils. The surface layer is fine sandy loam, and the underlying material is loam, clay loam, or sandy clay loam. Permeability is moderate, and the available moisture capacity is moderate. Natural fertility is high. Water erosion is a slight hazard in the more sloping areas. Soil blowing is a moderate hazard.

The soils in this unit are well suited to cultivation and are cultivated extensively. Cotton, sorghum, and small grain are the main crops. Suitable for pasture are switchgrass and johnsongrass. Vetch, guar, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. It is beneficial to apply a mulch of cotton burs or other residue occasionally, or to grow a winter cover crop occasionally. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIIe-4 (DRYLAND)

This unit consists of gently sloping, grayish-brown to reddish-brown soils on uplands. They are shallow over caliche. Both the surface layer and the underlying material consist of porous loam or clay loam. Permeability is moderate, and the available moisture capacity is moderate. Natural fertility is medium. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

The soils in this unit are suited to cultivation, but most areas are used as range. Cotton, sorghum, and small grain are the chief cultivated crops. Suitable for pasture are johnsongrass and side-oats grama. Vetch, sugar, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. A winter cover crop or a mulch of cotton burs or other residue should be used frequently. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture. Varying

the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIIe-5 (DRYLAND)

Veal fine sandy loam, 1 to 3 percent slopes, is the only soil in this unit. It occurs on uplands and is light colored, limy, and shallow to caliche. The underlying material is porous sandy clay loam. Permeability is moderate, and the available moisture capacity is moderate. Natural fertility is medium. Water erosion is a slight hazard, and soil blowing is a moderate hazard.

This soil can be cultivated if carefully managed, but most areas are used as range. Sorghum and small grain are the main cultivated crops. Small areas are used for cotton. Suitable for pasture are johnsongrass and switchgrass.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. A winter cover crop or a mulch of cotton burs or other residue should be used. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to control water erosion and to conserve moisture. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIIe-6 (DRYLAND)

This unit consists of gently sloping, deep, dark-colored soils on uplands. The surface layer is clay loam, and the underlying material is firm, blocky clay. Permeability is very slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

The soils in this unit can be cultivated if carefully managed, and they are cultivated extensively. Cotton, sorghum, and small grain are the main cultivated crops. Suitable for pasture are johnsongrass, blue grama, and side-oats grama. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. If cotton is grown in most years, a winter cover crop or a mulch of cotton burs or other residue should be used occasionally. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IIIs-1 (DRYLAND)

Tillman clay loam, 0 to 1 percent slopes, is the only soil in this unit. It is a deep, reddish-brown soil on uplands. The underlying material is firm, blocky clay that restricts root growth. Permeability is very slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard.

This soil is suited to cultivation and is cultivated extensively. The main crops are cotton, sorghum, and small grain. Suitable for pasture are side-oats grama, blue grama, and johnsongrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. If cotton is grown in most years, a winter cover crop or a mulch of cotton burs or other residue should be used frequently. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to hold water on the surface for longer periods so that the root zone can be kept moist to a greater depth.

CAPABILITY UNIT IIIce-1 (DRYLAND)

This unit consists of nearly level, deep, dark-colored soils on uplands. The surface layer is clay loam, and the underlying material is firm, blocky clay. Permeability is very slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard.

The soils in this unit are well suited to cultivation, but low rainfall limits the choice of crops. The chief crops are cotton, sorghum, and small grain. Suitable for pasture are blue grama, side-oats grama, and johnsongrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. An example of a suitable cropping system is cotton or some other row crop followed by sorghum, small grain, or some other high-residue crop. If cotton is grown in most years, a winter cover crop or a mulch of cotton burs or other residue should be used. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture. Varying the depth of plowing helps to prevent formation of a plowpan.

CAPABILITY UNIT IVe-1 (DRYLAND)

This unit consists of moderately sloping, brownish, limy soils on uplands. These soils are shallow to moderately deep over caliche. Both the surface layer and the underlying material are porous and friable loam or clay loam. Permeability is moderate, and the available moisture capacity also is moderate. Natural fertility is medium. Soil blowing is a slight hazard, and water erosion is a moderate to severe hazard.

The soils in this unit can be cultivated, but cultivation is risky. The main crops are sorghum and small grain.

Suitable for pasture are johnsongrass, switchgrass, and side-oats grama.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. Most areas should be kept in sorghum, small grain, or some other high-residue crop. Some areas 10 to 15 acres in size occur within larger areas of deep, gently sloping soils and are planted to cotton. These areas ought to be protected with a mulch of cotton burs or other residue or with a winter cover crop. If there is not enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture.

CAPABILITY UNIT IVe-2 (DRYLAND)

Miles fine sandy loam, 3 to 5 percent slopes, is the only soil in this unit. It is a deep, reddish-brown soil on uplands. The underlying material is friable sandy clay loam. Permeability is moderate, and the available moisture capacity also is moderate. Natural fertility is high. Both soil blowing and water erosion are moderate hazards.

This soil can be cultivated, but special management and careful selection of crops are needed. Sorghum, small grain, and cotton are the main crops. Suitable for pasture are johnsongrass, switchgrass, and side-oats grama.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system consists mostly of sorghum, small grain, or some other high-residue crop and includes only an occasional year of cotton or some other row crop. If cotton is grown, a mulch of cotton burs or other residue should be used or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture.

CAPABILITY UNIT IVe-3 (DRYLAND)

Veal fine sandy loam, 3 to 5 percent slopes, is the only soil in this unit. It is on uplands and is grayish brown, limy, and shallow to caliche. The underlying material is friable sandy clay loam. Permeability is moderate, and the available moisture capacity is moderate. Natural fertility is medium. Both soil blowing and water erosion are moderate hazards.

This soil can be cultivated, but special management and careful selection of crops are needed. Most areas are used as range. Sorghum and small grain are the main crops. Suitable for pasture are johnsongrass and switchgrass.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. Most areas should be kept in sorghum, small grain, or some other high-residue crop. Some areas 10 to 15 acres in size occur within larger areas of deep, gently sloping soils and are planted to cotton. These areas need to be protected with a mulch of cotton burs or other residue or with a winter cover crop. If there is not enough residue available for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture.

CAPABILITY UNIT IVe-4 (DRYLAND)

This unit consists of nearly level to gently undulating, deep, brownish soils. The surface layer is loamy fine sand, and the underlying material is friable sandy clay loam. These soils absorb water readily, and little water runs off them even after heavy rains. The available moisture capacity is moderate. Natural fertility is medium. Soil blowing is a severe hazard.

The soils in this unit can be cultivated if carefully managed. Cotton, sorghum, and small grain are the main crops. Suitable for pasture are johnsongrass, indiangrass, and switchgrass. Guar, vetch, and cowpeas are grown for hay or for soil improvement.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system consists mainly of sorghum, small grain, or some other high-residue crop and includes only an occasional year of cotton or some other row crop. If cotton is grown, a mulch of cotton burs or other residue should be used or a winter cover crop should be grown. If there is not enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Also effective is deep plowing, which brings moderately fine textured material to the surface. Fertilization helps to increase production of sorghum and small grain and thereby the amount of residue left to protect the soil. Terracing and contour farming help to slow runoff and to conserve moisture in the gently undulating areas.

CAPABILITY UNIT IVe-5 (DRYLAND)

Stamford clay, 1 to 3 percent slopes, is the only soil in this unit. It is a deep, brown, limy soil on uplands. The underlying material is compact clay. Permeability is very slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

This soil can be cultivated, but special management and careful selection of crops are needed. Most areas are used as range. Sorghum and small grain are the main crops. Suitable for pasture are side-oats grama, blue grama, and buffalograss.

The main concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system consists mainly of sorghum, small grain, or some other high-residue crop and includes only an occasional year of cotton or some other row crop. If cotton is grown, a mulch of cotton burs or other crop residue should be used or a winter cover crop should be grown. If there is not enough residue available for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture.

CAPABILITY UNIT IVe-6 (DRYLAND)

Mobeetie fine sandy loam, 3 to 5 percent slopes, is the only soil in this unit. It is a limy soil on uplands and is moderately deep over caliche. The underlying material

is friable loam. Permeability is moderate, and the available moisture capacity also is moderate. Natural fertility is medium. Both soil blowing and water erosion are moderate hazards.

This soil can be cultivated, but most areas are used as range. Special management and careful selection of crops are needed. Sorghum and small grain are the main crops. Suitable for pasture are johnsongrass, switchgrass, and side-oats grama.

The chief concerns in management are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. Most areas should be kept in sorghum, small grain, or some other high-residue crop. Some areas 10 to 15 acres in size occur within large areas of deep, gently sloping soils and are planted to cotton. These areas need to be protected with a mulch of cotton burs or other residue or with a winter cover crop. If there is not enough residue available for control of soil blowing, chiseling and listing are effective as emergency measures. Terracing and contour farming help to slow runoff and to conserve moisture.

CAPABILITY UNIT IVw-1 (DRYLAND)

Randall fine sandy loam and Randall clay (if drained) are the only soils in this unit. These are deep, dark-colored, poorly drained soils on the floors of playas. They are underlain by dense clay. Permeability is slow, and the available moisture capacity is high. Natural fertility is high. Wetness is a hazard during rainy periods, and soil blowing is a moderate hazard during dry periods. The dense clay inhibits the growth of plant roots.

Most areas of these soils are cultivated and are used for cotton, sorghum, and small grain. Suitable for pasture are johnsongrass, alfalfa, switchgrass, and Midland bermudagrass.

These soils occur in such small areas that they are managed along with the adjoining soils. Terracing and contour farming of the adjoining areas help to keep runoff from these soils and to decrease the wetness hazard. Using crop residue and chiseling and listing as emergency measures help to control soil blowing.

CAPABILITY UNIT Vw-1 (DRYLAND)

Lincoln soils, a complex of deep, light-colored, limy, sandy soils on bottom lands, makes up this unit. These soils are subject to frequent flooding, runoff from higher areas, scouring, and deposition of fresh material.

Areas of this unit are not suitable for dryland farming and are better used as range, as wildlife habitat, and as recreation areas.

CAPABILITY UNIT Vw-2 (DRYLAND)

This unit consists of deep, brownish, limy, loamy soils on bottom lands. These soils are subject to frequent flooding, runoff from high areas, slight scouring, and deposition of fresh material. Soil blowing is a slight hazard.

Areas of this unit are not suitable for dryland farming and are better used as range, as wildlife habitat, and as recreation areas.

CAPABILITY UNIT VIe-1 (DRYLAND)

This unit consists of Brownfield-Nobscot association, undulating. The soils in this association are brown to grayish brown. They have a thick surface layer of fine sand. The friable underlying material ranges from fine sandy loam to sandy clay loam. Soil blowing is a very severe hazard.

These soils are not suitable for dryland farming and are better used as range, as wildlife habitat, and as recreation areas.

CAPABILITY UNIT VIe-2 (DRYLAND)

Miles loamy fine sand, 3 to 5 percent slopes, is the only soil in this unit. This is a deep, brownish soil. The underlying material is friable sandy clay loam. Soil blowing is a severe hazard, and water erosion is a moderate hazard.

This soil is not suitable for dryland farming and is better used as range, as wildlife habitat, and as recreation areas.

CAPABILITY UNIT VIe-3 (DRYLAND)

This unit consists of gently sloping to steep, red to reddish-brown, limy soils on uplands. These soils are shallow to moderately deep over gypsum, soft sandstone, or packsand. Both the surface layer and the underlying material are loam or very fine sandy loam. Runoff is rapid, and the limy surface layer erodes easily.

These soils are not suitable for dryland farming and are better used as range, as recreation areas, and as wildlife habitat. Only scattered areas are suitable sites for farm ponds, because the underlying gypsum dissolves and water seeps out.

CAPABILITY UNIT VIe-4 (DRYLAND)

This unit consists of moderately sloping to steep, reddish-brown, limy soils on uplands. The surface layer is clay or clay loam. These soils are shallow over the compact clay underlying material. Water erosion is a severe hazard.

These soils are not suitable for cultivation and are better used as range, as recreation areas, and as wildlife habitat. Excellent sites for farm ponds occur in many areas.

CAPABILITY UNIT VIe-5 (DRYLAND)

This unit consists of moderately sloping to sloping, shallow to deep, grayish-brown, limy soils. The surface layer is loam, and the underlying material is porous, friable loam to clay loam. The available moisture capacity is medium. Because of the slope, water erosion is a severe hazard.

These soils are moderately fertile, but they are too sloping for cultivation. They are better used as range, as recreation areas, and as wildlife habitat. Sites suitable for farm ponds occur in some areas.

CAPABILITY UNIT VIe-6 (DRYLAND)

This unit consists of moderately sloping to sloping, deep, reddish-brown soils. The surface layer ranges from fine sandy loam to loamy fine sand, and the underlying material is friable sandy clay loam. The available moisture capacity is moderate. The supply of plant nutrients is medium to high. Because of the slope, water erosion is a severe hazard.

These soils are not suitable for cultivation and are better used as range, as wildlife habitat, and as recrea-

tion areas. Sites suitable for farm ponds occur in some areas.

CAPABILITY UNIT VIw-1 (DRYLAND)

Randall clay (not drained) is the only soil in this unit. (If drained, this soil is in dryland unit IVw-1.) It is a poorly drained, gray soil on the floors of playas. The underlying material is dense, compact clay. This soil is frequently flooded by runoff from higher areas, and water stands on the surface for several months in some years. Wetness is the chief limitation, but soil blowing is a slight hazard in dry years.

The areas of this soil generally are so small that they are managed along with the adjoining soils. For example, terracing and contour farming of the surrounding soils help to divert runoff from this soil and to decrease the wetness hazard. The areas are better suited to use as pasture, range, and wildlife habitat than to cultivation.

CAPABILITY UNIT VIIs-1 (DRYLAND)

This unit consists of nearly level to steep, very shallow, brownish or reddish, loamy soils underlain by caliche, gypsum, sandstone, or conglomerate rock. These soils have low available moisture capacity and are low in fertility. Water erosion is a severe hazard.

The areas of this unit are too shallow for cultivation. They are suitable only for use as range and as wildlife habitat. Sites suitable for farm ponds occur in some areas.

CAPABILITY UNIT VIIs-2 (DRYLAND)

This unit consists of broken, steep areas along the caprock escarpment; sandstone-capped areas near Dickens; and strongly dissected areas of the Croton Breaks. Most areas are too steep and too erodible for cultivation, but small amounts of forage grow in spots at the crests of steep areas and on small benches or shelves above drainageways. Many of these areas are so difficult to reach that livestock graze there only when the forage is depleted in other areas. Wildlife habitat and recreation are better uses for these areas than range.

CAPABILITY UNIT VIIIs-1 (DRYLAND)

The Badland part of Vernon-Badland complex, hilly, makes up this unit. This land type occurs in the west-central part of the county. It consists mostly of barren clay and shale. Vegetation grows only along drainageways and on small inclusions of soil.

These areas are unsuitable for range, because of the erosion hazard and the scarcity of vegetation. They are better used as wildlife habitat and recreation areas. They can be improved for these uses by control of grazing on the adjoining range sites and by fencing to keep livestock out.

Management of irrigated soils, by capability units

In the following pages the capability units for irrigated soils in Dickens County are described and suggestions for use and management are discussed. Commercial fertilizer and barnyard manure are needed to keep the irrigated soils productive. These should be applied in amounts based on soil tests and individual crop needs.

To find the capability classification of any given mapping unit, refer to the "Guide to Mapping Units."

CAPABILITY UNIT I-1 (IRRIGATED)

This unit consists of nearly level, deep, dark-colored, limy soils. The surface layer is loam or clay loam, and the underlying material is porous, friable clay loam. Permeability is moderate, and the available moisture capacity is high. Natural fertility also is high.

The soils in this unit are well suited to irrigated crops. Cotton is the main cash crop, but sorghum and small grain are grown also. Alfalfa, bermudagrass, johnsongrass, vetch, and sweetclover are among the crops grown for hay and for soil improvement.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated occasionally with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling and listing are effective as emergency measures. Efficient irrigation helps to conserve moisture. Either a surface system or a sprinkler system of irrigation can be used.

CAPABILITY UNIT I-2 (IRRIGATED)

This unit consists of nearly level, deep, brown to light reddish-brown, limy soils on bottom lands. The surface layer is very fine sandy loam or fine sandy loam, and the underlying material ranges from loamy fine sand to clay loam. Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Natural fertility is medium to high.

The soils in this unit are well suited to irrigated crops. Cotton, sorghum, and small grain are the main ones. Alfalfa, bermudagrass, johnsongrass, and sweetclover are grown for hay and for soil improvement.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated occasionally with sorghum, small grain, or a similar high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling and listing are effective as emergency measures. Efficient irrigation helps to conserve moisture. Either a surface system or a sprinkler system of irrigation can be used.

CAPABILITY UNIT I-3 (IRRIGATED)

This unit consists of nearly level, deep, dark-colored soils on bottom lands or on slightly concave uplands. The surface layer is clay loam, and the underlying material is blocky clay loam or clay. Permeability is slow, and the available moisture capacity is high. The capacity to hold plant nutrients also is high.

The soils in this unit are well suited to irrigated crops. Cotton is the main cash crop, but sorghum and small grain also are grown. Alfalfa, vetch, sweetclover, and bermudagrass are among the crops grown for pasture.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated occasionally with sorghum, small grain, or some other high-residue crop. If cotton is grown, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling and listing are effective as emergency measures. Efficient irrigation helps to conserve moisture. Either a surface system or a sprinkler system of irrigation can be used.

CAPABILITY UNIT IIe-1 (IRRIGATED)

This unit consists of gently sloping, moderately deep to deep, reddish-brown soils on uplands. The surface layer is loam or very fine sandy loam, and the underlying material is loam, sandy clay loam, or very fine sandy loam. Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Natural fertility is high. Both water erosion and soil blowing are slight hazards.

The soils in this unit are suited to irrigated crops. Cotton, sorghum, and small grain are the main ones. Alfalfa, bermudagrass, vetch, and sweetclover are grown for hay and for soil improvement.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling or listing to roughen the surface and form clods helps to keep the soil from blowing. Controlling water erosion is more difficult on these gently sloping soils than on nearly level soils. Efficient irrigation, by either a surface system or a sprinkler system, in combination with bench leveling, terracing, or contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IIe-2 (IRRIGATED)

This unit consists of gently sloping, deep, dark-colored soils on uplands. The surface layer is clay loam, and the underlying material is clay loam or clay. Permeability is moderate to slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

The soils in this unit are suited to irrigated crops. Cotton, sorghum, and small grain are the main ones. Alfalfa, bermudagrass, johnsongrass, and vetch are grown for hay or for soil improvement.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. Crop residue left o or near the surface after harvest helps to control so blowing. If the crop does not leave enough residue, chise ing and listing are effective as emergency measures. Cor trolling water erosion is more difficult on these gentl sloping soils than on nearly level soils. Efficient irrigatio by either a surface system or a sprinkler system, in con bination with bench leveling, terracing, or contour farn ing, helps to control washing and to conserve water.

CAPABILITY UNIT IIe-3 (IRRIGATED)

This unit consists of nearly level, deep, dark-brown c reddish-brown soils on uplands. The surface layer is fin sandy loam, and the underlying material is friable sand clay loam. Permeability is moderate, and the availabl moisture capacity is moderate. Natural fertility is higl Soil blowing is a moderate hazard.

The soils in this unit are well suited to irrigated crop: Cotton, sorghum, and small grain are the main ones. Al falfa, bermudagrass, johnsongrass, and switchgrass ar among the crops grown for hay and pasture.

The chief concerns in irrigated farming are control o erosion, conservation of moisture, maintenance of fertility and improvement of tilth. A suitable cropping system i one in which cotton or some other row crop is alternate with sorghum, small grain, or a similar high-residue crop If cotton is grown year after year, a mulch of cotton bur or other residue should be applied occasionally or a winte cover crop should be grown. Crop residue left on or nea the surface after harvest helps to control soil blowing. I the crop does not leave enough residue, chiseling or listing to roughen the surface and form clods helps to keep th soil from blowing. The surface and sprinkler methods o irrigation help to control washing and to conserve water

CAPABILITY UNIT IIe-4 (IRRIGATED)

This unit consists of gently sloping, deep, reddish-brow to grayish-brown soils on uplands. The surface layer i fine sandy loam, and the underlying material is loam o sandy clay loam. Permeability is moderate, and the available moisture capacity is moderate. Natural fertility i high. Soil blowing is a moderate hazard, and water erosio is a slight hazard.

The soils in this unit are suited to irrigated crops Cotton, sorghum, and small grain are the main ones Bermudagrass, switchgrass, johnsongrass, and alfalfa ar among the crops suitable for hay and pasture.

The chief concerns in irrigated farming are contro of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or a similar high-residu crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling or listing to roughen the surface and form clods helps to keep the soil from blowing. Controlling water erosion is more difficult on these gently sloping soils than on nearly level soils. Efficient irrigation, by either a surface system or a sprinkler system, in combination with bench level-

ing, terracing, or contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IIs-1 (IRRIGATED)

This unit consists of nearly level, deep, dark-colored soils on uplands. The surface layer is clay loam, and the underlying material is firm, blocky clay. Permeability is very slow, and the available moisture capacity is high. Natural fertility also is high. Soil blowing is a slight hazard.

The soils in this unit are well suited to cultivation. Cotton is the main cash crop, but sorghum and small grain also are grown. Bermudagrass, johnsongrass, and alfalfa are among the plants grown for pasture and hay.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to prevent surface crusting and to control blowing. If the crop does not leave enough residue, chiseling and listing are effective as emergency measures. Efficient irrigation helps to control washing and to conserve water. A surface method is to be preferred.

CAPABILITY UNIT IIIe-2 (IRRIGATED)

This unit consists of moderately sloping, moderately deep to deep, reddish-brown soils on uplands. The surface layer is loam or very fine sandy loam, and the underlying material is loam, very fine sandy loam, or sandy clay loam. Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Natural fertility is high. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

The soils in this unit are suited to irrigated crops. Cotton, sorghum, and small grain are the main ones. Bermudagrass, johnsongrass, and alfalfa are among the crops grown for pasture and hay.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied frequently or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control soil blowing. If the crop does not leave enough residue, chiseling or listing to roughen the surface and form clods helps to keep the soil from blowing. Controlling water erosion is more difficult on these moderately sloping soils than on nearly level soils. Efficient irrigation, by either a surface system or a sprinkler system, in combination with bench leveling, terracing, or contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IIIe-4 (IRRIGATED)

This unit consists of gently sloping, grayish-brown to reddish-brown soils on uplands. These soils are shallow over caliche. Both the surface layer and the underlying material consist of porous loam or clay loam. Permeability is moderate, and the available moisture capacity also is moderate. Natural fertility is medium. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

The soils in this unit are suited to irrigated crops, but only a few small areas are irrigated. Cotton, sorghum, and small grain are the main crops. Bermudagrass, johnsongrass, and alfalfa are among the crops grown for pasture and hay.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied frequently or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue to keep the soil from blowing, chiseling and listing are effective as emergency measures. Efficient irrigation, by either a surface system or a sprinkler system, in combination with bench leveling, terracing, or contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IIIe-5 (IRRIGATED)

Veal fine sandy loam, 1 to 3 percent slopes, is the only soil in this unit. It is a light-colored, limy soil on uplands. The underlying material is porous sandy clay loam. Caliche is near the surface. Permeability is moderate, and the available moisture capacity is moderate. Natural fertility is medium. Soil blowing is a moderate hazard, and water erosion is a slight hazard.

This soil is suited to irrigated crops, but only a few small areas are irrigated. Cotton, sorghum, and small grain are the main crops. Bermudagrass, johnsongrass, and alfalfa are among the crops grown for hay and pasture.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied frequently or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue to keep the soil from blowing, chiseling and listing are effective as emergency measures. Efficient irrigation, by either a surface system or a sprinkler system, in combination with bench leveling, terracing, or contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IIIe-6 (IRRIGATED)

This unit consists of gently sloping, deep, dark-colored soils on uplands. The surface layer is clay loam, and the underlying material is firm, blocky clay. Permeability is very slow, and the available moisture capacity is moderate. Natural fertility is high. Soil blowing is a slight hazard, and water erosion is a moderate hazard.

The soils in this unit are suited to irrigated crops, but special management practices are needed to control erosion. Cotton, sorghum, and small grain are the main

crops. Bermudagrass, johnsongrass, and alfalfa are grown for hay and pasture.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be used occasionally or a winter cover crop should be grown. Residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue to keep the soil from blowing, chiseling and listing are effective as emergency measures. Efficient irrigation, by either a surface system or a sprinkler system, in combination with bench leveling, terracing, or contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IIIe-7 (IRRIGATED)

Miles fine sandy loam, 3 to 5 percent slopes, is the only soil in this unit. It is a deep, reddish-brown soil on uplands. The underlying material is friable sandy clay loam. Permeability is moderate, and the available moisture capacity is moderate. Natural fertility is high. Both soil blowing and water erosion are moderate hazards.

This soil is suited to irrigated crops. Cotton, sorghum, and small grain are the main ones. Johnsongrass, switchgrass, and side-oats grama are the main crops grown for pasture.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied frequently or a winter cover crop should be grown. Crop residue left on or near the surface after harvest helps to control erosion. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Efficient irrigation, by either a surface system or a sprinkler system, in combination with bench leveling, terracing, or contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IIIe-8 (IRRIGATED)

This unit consists of nearly level to gently undulating, deep, brownish soils. The surface layer is loamy fine sand, and the underlying material is friable sandy clay loam. Permeability is moderate. These soils absorb water readily, and little water runs off them even after heavy rains. The available moisture capacity is moderate. Natural fertility is medium. Soil blowing is a severe hazard.

These soils are suited to irrigated crops. Cotton, sorghum, and small grain are the main ones. Midland bermudagrass, switchgrass, johnsongrass, and alfalfa are the principal plants grown for pasture.

The chief concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. A suitable cropping system is one in which cotton or some other row crop is alternated with sorghum, small grain, or some other high-residue crop. If cotton is grown year after year, a mulch of cotton burs or other residue should be applied occasionally or a winter cover crop should be grown. If there is not enough residue available for control of soil blowing, chiseling and listing are effective as emergency measures. Also effective is deep plowing, which brings moderately fine textured material to the surface. Efficient irrigation, by the sprinkler method, in combination with terracing and contour farming, helps to control washing and to conserve water.

CAPABILITY UNIT IVe-7 (IRRIGATED)

This unit consists of Brownfield-Nobscot association, undulating, which is on upland plains. These soils have a thick surface layer of fine sand and friable underlying material ranging from fine sandy loam to sandy clay loam. The available moisture capacity is low. Natural fertility also is low. Soil blowing is a very severe hazard.

The soils in this unit are suited to irrigated crops, but special conservation measures and careful selection of crops are needed. Grain sorghum and wheat are the main crops. Midland bermudagrass, switchgrass, and alfalfa are the main ones grown for pasture.

The chief management concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. Soil and water can be conserved if rows of sorghum, small grain, or other high-residue crops are spaced not more than 20 inches apart and the residue is left after harvest. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures, particularly if done when the surface layer is moist after rain. Efficient irrigation by the sprinkler method helps to conserve water.

CAPABILITY UNIT IVe-8 (IRRIGATED)

Miles loamy fine sand, 3 to 5 percent slopes, is the only soil in this unit. It is a deep, brownish soil. The underlying material is friable sandy clay loam. The available moisture capacity is low. Natural fertility also is low. Soil blowing is a severe hazard, and water erosion is a moderate hazard.

This soil is suited to irrigated crops, but special conservation measures and careful selection of crops are needed. Grain sorghum and wheat are the main crops. Midland bermudagrass and switchgrass are the main pasture crops.

The chief management concerns in irrigated farming are control of erosion, conservation of moisture, maintenance of fertility, and improvement of tilth. Soil and water can be conserved and erosion reduced if rows of sorghum, small grain, or other high-residue crops are spaced not more than 20 inches apart and the residue is left after harvest. If the crop does not leave enough residue for control of soil blowing, chiseling and listing are effective as emergency measures. Efficient irrigation by the sprinkler method helps to control washing and to conserve water.

Predictions of Yields

Crop yields in Dickens County depend on how well the soils have been managed. Consistent high yields can be obtained if the soils are used within their capabilities and are managed according to their needs.

Table 2 gives, for each soil in the county judged suitable for crops, predicted average yields per acre under a high level of management. These predictions are for cotton, grain sorghum, and wheat grown on dryland soils and for cotton and grain sorghum grown on irrigated soils. Not enough wheat is grown under irrigation in this county for predictions of yields to be made. The predictions are based on experiments over a period of 10 to 20 years, on records kept at the experiment station at Spur, and on information obtained from farmers and others familiar with the soils.

A high level of management for dryland soils in this county consists of—

1. Managing crop residue in a way that effectively controls erosion and protects the soil.
2. Using a cropping sequence that maintains an adequate supply of organic material.
3. Conserving rainwater.
4. Maintaining fertility by the timely application of fertilizer and by growing soil-improving crops.
5. Controlling insects, diseases, and weeds.
6. Keeping tillage to a minimum and tilling only when the moisture content is such that compaction is minimized.
7. Planting improved crop varieties .
8. Using terraces and other mechanical aids and maintaining them effectively.

A high level of management for irrigated soils consists of the foregoing practices and in addition—

1. Applying water according to the needs of the crops and the soil.
2. Coordinating tillage operations with irrigation operations.
3. Using properly designed irrigation systems and land treatments to help reduce erosion.

TABLE 2.—*Predicted average acre yields of principal crops on dryland soils and irrigated soils under a high level of management*

[Only the arable soils are listed in this table. Absence of data indicates that crop generally is not grown on the soil named]

Soil	Dryland soils			Irrigated soils	
	Cotton	Grain sorghum	Wheat	Cotton	Grain sorghum
	Lb. of lint	*Lb.*	*Bu.*	*Lb. of lint*	*Lb.*
Abilene clay loam, 0 to 1 percent slopes	190	1, 100	17	850	7, 000
Bippus clay loam, 1 to 3 percent slopes	160	750	14	750	5, 000
Brownfield-Nobscot association, undulating					3, 200
Carey loam, 1 to 3 percent slopes	170	1, 000	15	800	4, 500
Carey loam, 3 to 5 percent slopes	110	560	12	520	3, 300
Enterprise very fine sandy loam, 1 to 3 percent slopes	190	1, 250	15	800	4, 500
Enterprise very fine sandy loam, 3 to 5 percent slopes	150	900	12		3, 300
Lincoln loamy fine sand, loamy substratum variant	150	900	13	625	4, 000
Lofton clay loam	170	1, 500	17	900	7, 000
Mangum soils	190	1, 500	17	850	7, 000
Mansker loam, 1 to 3 percent slopes	120	600	11	550	3, 000
Mansker loam, 3 to 5 percent slopes		500	10		1, 200
Meno fine sandy loam	200	1, 200	15	850	7, 000
Meno loamy fine sand	160	900	13	550	5, 000
Miles fine sandy loam, 0 to 1 percent slopes	200	1, 200	15	850	7, 000
Miles fine sandy loam, 1 to 3 percent slopes	180	1, 000	13	800	4, 500
Miles fine sandy loam, 3 to 5 percent slopes	125	600	11		3, 500
Miles loamy fine sand, 0 to 3 percent slopes	160	900	13	550	5, 000
Mobeetie fine sandy loam, 1 to 3 percent slopes	140	700	15	550	4, 500
Mobeetie fine sandy loam, 3 to 5 percent slopes		400	13		
Olton clay loam, 0 to 1 percent slopes	185	1, 100	17	850	7, 000
Olton clay loam, 1 to 3 percent slopes	145	800	14	750	5, 000
Portales loam, 0 to 1 percent slopes	185	1, 500	17	850	7, 000
Pullman clay loam, 0 to 1 percent slopes	185	1, 500	17	850	7, 000
Pullman clay loam, 1 to 3 percent slopes	140	800	14	750	5, 000
Randall clay		600	14	625	4, 100
Randall fine sandy loam	170	750	13	700	4, 100
Spur clay loam	190	1, 500	17	850	7, 000
Spur fine sandy loam	190	1, 500	17	850	7, 000
Stamford clay, 1 to 3 percent slopes	110	400	10		
Tillman clay loam, 0 to 1 percent slopes	150	900	14	550	5, 000
Tillman clay loam, 1 to 3 percent slopes	140	800	10	500	3, 200
Veal fine sandy loam, 1 to 3 percent slopes	115	600	11	550	3, 000
Veal fine sandy loam, 3 to 5 percent slopes		500	10		1, 200
Weymouth clay loam, 1 to 3 percent slopes	160	900	13	550	3, 000
Weymouth clay loam, 3 to 5 percent slopes		500	10		
Woodward loam, 1 to 3 percent slopes	165	800	15	800	4, 200
Woodward loam, 3 to 5 percent slopes	125	550	12	520	2, 500
Yahola very fine sandy loam	175	900	15	750	6, 000

Range Management[3]

Native grassland covers 69 percent of Dickens County, or about 409,000 acres. There are four distinct kinds of rangeland. The area that has the highest potential covers about 7,300 acres of the High Plains, in the northwestern part of the county. The soils are deep and level to gently sloping. They are productive if the moisture supply is adequate. The next best rangeland is on the sandy soils in the northeastern part of the county. This area, which covers about 69,800 acres, is productive if well managed. An area of about 195,000 acres in the southeastern part is least suitable for range. It is dissected by canyons, gullies, and creeks; the soils are gently sloping to steep, very shallow to deep, and moderately permeable; and much water is lost as runoff. The rest of the rangeland, about 136,900 acres, consists of nearly level to rolling, chiefly gently sloping to moderately sloping, deep, moderately permeable soils.

Range sites and condition classes

Soils are grouped into range sites on the basis of similarity in the characteristics that affect their capacity for producing native forage plants. Twelve range sites are recognized in Dickens County. Each site has a distinctive potential plant community, the composition of which depends upon a combination of environmental conditions, mainly the combined effects of soil and climate. The potential plant community reproduces itself so long as the environmental conditions remain the same.

Range condition is rated by comparing the composition of the existing plant community with that of the potential plant community. Four range condition classes are recognized: excellent, good, fair, and poor. A range is in excellent condition if 76 to 100 percent of the existing vegetation is of the same composition as that of the potential stand. It is in good condition if the percentage is between 51 and 75, in fair condition if the percentage is between 26 and 50, and in poor condition if the percentage is less than 26.

The plants on any given range site are grouped, according to their response to grazing, as decreasers, increasers, and invaders. Decreasers are plants in the potential plant community that tend to die out if heavily grazed. Increasers are plants in the potential community that become more abundant as the decreasers decline, and then start to die out if heavy grazing continues. Invader plants are not a part of the original stand, but they generally take over if both the increasers and decreasers disappear.

Descriptions of the range sites

The soils of Dickens County have been grouped into twelve range sites, which are described in the following pages. In each description are shown important soil characteristics, principal plants, suggestions for management, and estimates of yields. The yield estimates are based on range clippings and the experience of ranchers.

To find the range site in which a given soil has been placed, turn to the "Guide to Mapping Units." Only those soils suitable for range have been placed in range sites.

[3] By HERSHEL M. BELL, range conservationist, Soil Conservation Service.

LOAMY BOTTOMLAND RANGE SITE

This site occurs along stream courses, canyons, and draws throughout the county. It totals less than 15,000 acres. Occasional flooding and run-in from the adjacent areas, high fertility, and high available moisture capacity make it the most productive range site in the county.

If this site is in good to excellent condition, the vegetation consists of good stands of tall and mid grasses and only scattered trees or shrubs, such as hackberry or cottonwood. Deterioration is rapid, however, if grazing is excessive or if adverse weather prevails. Deterioration results in loss of the tall grasses and invasion by brush and numerous annual and perennial weeds.

About 70 percent of the vegetation of this site consists of indiangrass, switchgrass, sand bluestem, little bluestem, side-oats grama, Canada wildrye, and other decreaser plants. The major increasers are vine-mesquite, western wheatgrass, blue grama, Texas bluegrass, Texas wintergrass, silver bluestem, and meadow dropseed. Alkali sacaton is a rapid increaser where the soils are saline. The common invaders are sunflower, cocklebur, woolly tidestromia, buffalo-bur, hairy caltrop, camphorweed, annual broomweed, croton, thistle, sandbur, western ragweed, mesquite, condalia, and pricklypear. The invaders limit forage production to low-yielding grasses, such as buffalograss, three-awn, and sand dropseed.

This site responds readily to brush control, either mechanical or chemical. Chemical foliage sprays are not effective on mesquite, which now heavily infests the bottom lands and ranges in size from low-growing bushes to sturdy trees. The site responds also to range seeding where flooding is not a problem or where grass can be established between floods.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 3,600 pounds per acre in favorable years and about 2,000 pounds per acre in less favorable years.

SANDY BOTTOMLAND RANGE SITE

This site is adjacent to the larger rivers and to streams that contain water only during storms. It totals about 3,500 acres. The slope is level to gently sloping or undulating. This site resembles the Loamy Bottomland site, both in physical characteristics and in vegetation. Forage production is lower, however, because the Sandy Bottomland site has a less favorable moisture capacity.

Tall and mid grasses are dominant if this site is in excellent condition. Sand bluestem and switchgrass are the main decreasers, but indiangrass, little bluestem, sideoats grama, and Canada wildrye also are abundant. Among the increasers are western wheatgrass, vine-mesquite, meadow dropseed, silver bluestem, and hairy grama. Alkali sacaton is an increaser where the soils are saline. Common invaders are buffalograss, sand dropseed, three-awn, hooded windmillgrass, annual weeds, western ragweed, mesquite, lotebush, inland saltgrass, and saltcedar.

This site responds favorably to control of brush. Controlling the heavy stands of mesquite is the major problem. Mechanical control of mesquite and saltcedar is more effective than control by chemical foliage sprays.

Basal treatment of tree-type mesquite with oil and chemicals is effective. Range seeding can be combined with mechanical control of brush. Soil blowing is a hazard, however, unless these sandy soils are stabilized by plant residue or are otherwise protected.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 3,500 pounds per acre in favorable years and about 2,000 pounds per acre in less favorable years.

DEEP HARDLAND RANGE SITE

This site occurs in most parts of the county. It totals 77,800 acres. Large areas are on the High Plains and in the more nearly level areas of the Rolling Plains. The site is smooth and, when in good condition, is not infested with brush. The slope generally is less than 3 percent. The soils are droughty.

Blue grama and buffalograss are the dominant forage plants (fig. 13). These and other short grasses can withstand a lack of moisture and continue to grow even if the site deteriorates. Mesquite generally is present.

The major decreasers are blue grama, side-oats grama, vine-mesquite, and western wheatgrass. Among the major increasers are buffalograss, silver bluestem, tobosagrass, and white tridens. Alkali sacaton is an increaser where the soils are saline, and Texas wintergrass is an increaser only on the Rolling Plains. As this site deteriorates, buffalograss becomes more abundant than blue grama, and then low-quality grasses, annual weeds, perennial weeds, and brush invade. Among the common invaders are perennial three-awn, sand dropseed, hairy tridens, Texas grama, tumblegrass, western ragweed, pricklypear, mesquite, and lotebush.

This site responds readily to brush control, both mechanical and chemical. Range seeding is effective if a litter crop or plant residue is used to protect the seedlings (fig. 14). Pits, excavations, furrows, or ridges help to control runoff and conserve water. Where there is a source of extra water, properly designed and installed water-spreading structures also are beneficial.

Forage production in areas on the High Plains differs from that in areas on the Rolling Plains. If the areas on the High Plains are in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 3,000 pounds per acre in favorable years and is about 800 pounds per acre in less favorable years. On the Rolling Plains the total annual yield ranges from 1,500 to 2,500 pounds per acre, both in favorable and in unfavorable years.

Figure 13.—**Blue grama and buffalograss in a grazed area of the Deep Hardland range site invaded by mesquite and pricklypear.**

Figure 14.—**Plains bristlegrass seeded in an ungrazed area of the Deep Hardland range site.**

CLAY FLATS RANGE SITE

Stamford clay, 1 to 3 percent slopes, is the only soil in this site, which is on upland flats in the western part of the county. The site generally occurs at the base of the caprock escarpment and other high areas. It totals only about 200 to 300 acres. Run-in water generally helps to increase forage production.

If this site is in excellent condition, the vegetation consists of drought-resistant mid and short grasses. The major decreasers are side-oats grama, blue grama, western wheatgrass, vine-mesquite, and white tridens. Major increasers are tobosagrass and buffalograss. Alkali sacaton is an increaser where the soils are saline. Tobosagrass usually becomes dominant. Pricklypear, cholla, lotebush, low-growing mesquite, running mesquite, and other woody plants are the chief invaders, but invasion by these plants is no more than moderate, because tobosagrass is strong enough to hold its own against most invaders.

This site responds to brush control, but good management of grazing also is needed. Range seeding is not effective, because the soils are droughty. If seeding is required, only the methods used for growing crops are effective.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 2,400 pounds per acre in favorable years and about 800 pounds per acre in unfavorable years.

MIXEDLAND RANGE SITE

This site is mostly in the east-central part of the county. It totals about 90,000 acres. The pattern is one of gently sloping to steep, rolling hills and well-defined drainage. The vegetation is predominantly short grasses, but there are some mid grasses.

If this site is in excellent condition, decreaser plants make up about 65 percent of the vegetation. The major decreasers are blue grama, side-oats grama, Arizona cottontop, plains bristlegrass, western wheatgrass, and vine-mesquite. Little bluestem and switchgrass are minor decreasers. The major increasers are buffalograss, hairy grama, silver bluestem, tall dropseed, Texas wintergrass, and perennial three-awn. Chief among the invaders are hairy tridens, Texas grama, red grama, sand muhly, tumble windmillgrass, hooded windmillgrass, tumblegrass, gummy lovegrass, annual and perennial weeds, pricklypear, tasajillo, lotebush, and mesquite.

This site responds to brush control, both mechanical and chemical. Range seeding also is effective.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 2,700 pounds per acre in favorable years and about 1,600 pounds per acre in less favorable years.

SANDY LOAM RANGE SITE

This site is mostly on smooth uplands of the Rolling Plains. It totals about 60,000 acres. The areas are gently

sloping to moderately steep. The slope generally is less than 10 percent. Short grasses are dominant.

If this site is in excellent condition, decreaser plants make up about 70 percent of the vegetation. The major decreasers are blue grama, side-oats grama, little bluestem, Arizona cottontop, plains bristlegrass, vine-mesquite, sand lovegrass, and needle-and-thread. Major increasers are buffalograss, hairy grama, silver bluestem, perennial three-awn, and sand dropseed. Among the invaders are tumble windmillgrass, hooded windmillgrass, gummy lovegrass, red lovegrass, red grama, western ragweed, spectacle-pod, annual wild buckwheat, croton, pricklypear, mesquite, and yucca.

This site responds to brush control by aerial application of chemicals. Usually the treatment has to be repeated at intervals of 3 to 6 years.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 3,000 pounds per acre in favorable years and about 1,800 pounds per acre in less favorable years.

SANDYLAND RANGE SITE

This site is mainly in level to gently rolling areas in the northern part of the county. It totals about 20,000 acres. The vegetation consists of tall grasses and motts of shin oak.

If this site is in excellent condition, decreasers make up about 70 percent of the vegetation. The major ones are indiangrass, sand bluestem, little bluestem, switchgrass, sand lovegrass, side-oats grama, and needle-and-thread. Major increasers are giant dropseed, sand dropseed, blue grama, hairy grama, silver bluestem, perennial three-awn, sand paspalum, fall witchgrass, hooded windmillgrass, sand sagebrush, and shin oak. Among the invaders are numerous annuals, gummy lovegrass, red lovegrass, tumble lovegrass, tumble windmillgrass, fringed signalgrass, western ragweed, queensdelight, yucca, and scattered stands of tree-type mesquite.

This site responds readily to brush and weed control by chemical methods (fig. 15). Mechanical methods would result in soil blowing. If the response is slow, overseeding may be beneficial.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 3,200 pounds per acre in favorable years and about 1,700 pounds per acre in unfavorable years.

DEEP SAND RANGE SITE

Brownfield-Nobscot association, undulating, makes up this site, which occurs in the northeastern quarter of the county. The areas total about 47,000 acres. The vegetation is similar to that on the Sandyland range site, with which it is closely associated. Tall grasses are dominant, and there are scattered motts of scrub oak.

If this site is in excellent condition, decreasers make up about 70 percent of the vegetation. The major ones

Figure 15.—An area of the Sandyland range site in need of brush control.

are sand bluestem, little bluestem, indiangrass, switchgrass, sand lovegrass, big sandreed, and needle-and-thread. Major increasers are side-oats grama, hairy grama, giant dropseed, silver bluestem, hooded windmillgrass, sand paspalum, perennial three-awn, fall witchgrass, and shin oak. Areas that have deteriorated have an almost closed canopy of shin oak. Among the invaders are gummy lovegrass, tumblegrass, tumble lovegrass, red lovegrass, tumble windmillgrass, fringed signalgrass, yucca, sand sagebrush, groundsel, queensdelight, western ragweed, and many annual weeds.

This site responds well to brush control by chemical foliage sprays. Range seeding by broadcasting is successful in some places, but it should be done only as a last resort.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 3.400 pounds per acre in favorable years and about 1,700 pounds per acre in less favorable years.

SHALLOW REDLAND RANGE SITE

This site is in the rougher parts of the Rolling Plains, near the escarpment at the edge of the High Plains, and in the broken areas near the main streams. It totals about 28,000 acres. The vegetation consists mainly of mid and short grasses, but not more than 25 percent of the site has a grass cover.

If this site is in excellent condition, 65 to 70 percent of the vegetation consists of decreasers (fig. 16). The major ones are blue grama, side-oats grama, vine mesquite, little bluestem, and sand bluestem. The major increasers are buffalograss, tobosagrass, hairy grama, sand dropseed, perennial three-awn, silver bluestem, slim tridens, and rough tridens. Among the major invaders are hairy tridens, sand muhly, Texas grama, red grama, mesquite, pricklypear, redberry juniper, and numerous annual and perennial weeds.

The smoother, deeper soils of this site respond to mechanical brush control. Brush should be left on the rougher, shallower soils because it is the best protective cover that can be established. Control of brush by chemical foliage sprays is not satisfactory, because uniform application is difficult.

If this site is in excellent condition, the total annual yield of herbage, air-dry weight, is as much as 2,000 pounds per acre in favorable years and about 1,200 pounds per acre in less favorable years.

VERY SHALLOW RANGE SITE

This site totals about 7,500 acres. It occurs in most parts of the county but chiefly along the junction of the High Plains and the Rolling Plains. The areas are rolling to hilly and, in some places, occur as knolls or fairly steep escarpments. Caliche, gravel, or rock is exposed

***Figure 16.*—An area of the Shallow Redland range site.**

in many places. The vegetation, which is sparse, consists mainly of mid grasses, but there are also short and tall grasses (fig. 17).

The major decreasers on this site are side-oats grama, blue grama, Arizona cottontop, plains bristlegrass, vine-mesquite, little bluestem, and sand bluestem. The major increasers are hairy grama, black grama, buffalograss, perennial three-awn, slim tridens, and rough tridens. Among the invaders are hairy tridens, Texas grama, sand dropseed, pricklypear, mesquite, yucca, and redberry juniper.

Little except control of grazing can be done to improve this site. Brush control is feasible in scattered areas, but the removal of brush could lead to erosion.

Forage production is low even if this site is in excellent condition. The total annual yield of herbage, air-dry weight, is as much as 1,700 pounds per acre in favorable years and only about 800 pounds per acre in less favorable years.

GYPLAND RANGE SITE

This site is mainly on the rough, broken parts of the Rolling Plains. It totals about 25,000 acres. The areas are nearly level to rolling or steep. Some occur as narrow bands or ledges adjacent to hills and extend for several miles at a uniform elevation. The vegetation consists mostly of short and mid grasses, but tall grasses grow in the most favorable spots.

Areas of this site that contain the most gypsum have the fewest kinds and the smallest amounts of vegetation. Where the gypsum content is moderate, the major decreaser plants are blue grama, side-oats grama, hairy grama, and vine-mesquite and lesser amounts of Arizona cottontop, plains bristlegrass, little bluestem, sand bluestem, indiangrass, and switchgrass. Major increasers are black grama, slim tridens, rough tridens, reverchoni panicum, fall witchgrass, buffalograss, sand dropseed, and perennial three-awn. Almost pure stands of sand dropseed and perennial three-awn occur in some places. Alkali sacaton may be dominant for a time and finally give way to inland saltgrass. Among the invaders are annual weeds, catclaw, yucca, low-growing mesquite, and scattered redberry juniper bushes.

Little except control of grazing can be done to improve this site. Overseeding and tree dozing are feasible in a few areas but not as general practices.

Forage production is low even if this site is in excellent condition. The total annual yield of herbage, air-dry weight, is only 1,100 pounds per acre in favorable years and about 500 pounds per acre in less favorable years.

Figure 17.—An area of the Very Shallow range site.

ROUGH BREAKS RANGE SITE

This site totals about 35,000 acres. Much of it is on the rough escarpment between the High Plains and the Rolling Plains. Large areas also occur throughout the Rolling Plains where water erosion is severe and has cut the rangeland into a network of V-shaped gullies. The vegetation is of good quality, but it covers only 25 percent of the surface in many places.

The major decreasers on this site are indiangrass, Canada wildrye, sand bluestem, little bluestem, side-oats grama, blue grama, plains bristlegrass, Arizona cottontop, and vine-mesquite. Major increasers are hairy grama, silver bluestem, slim tridens, fall witchgrass, sand dropseed, perennial three-awn, and buffalograss. The invaders are mostly catclaw, lotebush, pricklypear, yucca, mesquite, redberry juniper, and other shrubs and woody plants.

This site is so rough that between 50 and 75 percent of it is inaccessible to grazing animals. No range improvement practices are feasible, but some improvement may result from management of adjacent sites.

The total annual yield of herbage, air-dry weight, is only 500 to 900 pounds per acre, both in favorable and in unfavorable years.

Wildlife

Wildlife has become an important source of recreation and income in some areas of Dickens County. Many small ranches and farm-ranch enterprises have leased hunting rights, chiefly to nonresidents.

Bobwhite quail is the biggest hunting attraction at present, but some scaled quail (blue quail) also are hunted in the same areas. Doves and waterfowl offer good hunting during most seasonal migrations. White-tailed deer are increasingly important as a source of recreation and revenue. Also present are antelopes, coyotes, bobcats, jackrabbits, cottontail rabbits, badgers, skunks, raccoons, opossums, small rodents, lizards, and snakes. The rattlesnake is the only poisonous snake in this county.

Fishing in Dickens County is limited mainly to farm ponds, and these ponds are so small (mostly less than 1.5 surface acres) that fish production is limited and does not provide extra income for landowners or operators. Largemouth bass, sunfish, and channel catfish are usually stocked in these ponds.

Four general kinds of wildlife areas occur in this county: (1) sandy areas, (2) loamy areas, (3) Croton Breaks and rough areas, and (4) tightland areas.

The sandy areas are mainly in the northeastern part of the county. They coincide roughly with soil association 4. (See the General Soil Map at the back of this survey.) The vegetation in these areas consists mostly of tall grasses and small brushy plants, such as shin oak and sand sage. The deer population is largest here, for these areas offer the largest supply and greatest variety of browse. Bobwhite quail and scaled quail find excellent protection from predators and are abundant where adequate food is available. Habitat for quail and deer has been improved in the sandy areas by supplemental feeders or by special feed-grain plantings.

The loamy areas generally are north of Dickens and west of the sandy areas. They coincide roughly with soil associations 3 and 5. The native vegetation consists of a mixture of short, mid, and tall grasses. Large parts of these areas are cultivated, and small parts are used for range. Bobwhite quail and scaled quail are the most important game species. Some of the best quail hunting is available here because quail concentrate where a protective cover of shin oak grows along the fences. Feeders or special wildlife plantings for food and protective cover help to maintain a large quail population.

Most of the Croton Breaks and rough areas occur within large ranches in the eastern part of the county. The areas coincide roughly with soil association 1. They have good potential for attracting wildlife but lack enough food and water. Special management is required. There are scattered coveys of scaled quail and bobwhite quail and, along Croton Creek and the South Wichita River, scattered flocks of turkeys.

The tightland areas are mostly in the southern half of the county and coincide roughly with soil associations 2, 6, and 7. Large acreages are cultivated. Antelope were once fairly abundant in these areas, but hunters have killed most of them. Scaled quail is the dominant game species, and there are smaller numbers of bobwhite quail. If protective cover and supplemental food plantings are provided, the quail population could be increased successfully.

Engineering Uses of the Soils [3]

Soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, facilities for water storage, erosion control structures, and drainage systems. The properties most important to an engineer are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and pH. Topography, the depth to bedrock, and the depth to the water table are important also.

Information in this survey can be used to—

1. Make preliminary estimates of the engineering properties of soils for use in planning the construction of terraces, farm ponds, irrigation systems, and other structures for soil and water conservation.
2. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, and pipelines, and in planning detailed investigations at the selected sites.
3. Locate probable sources of topsoil, sand, gravel, and other construction material.
4. Correlate performance of engineering structures with soil mapping units and thus develop information useful in designing and maintaining structures.
5. Determine the suitability of soils for cross-county movement of vehicles and construction equipment.
6. Supplement information obtained from other published maps, reports, and aerial photographs

[3] By Y. E. McAdams, area engineer, Soil Conservation Service, Lubbock, Tex.

for the purpose of making maps and reports that can be used readily by engineers.

7. Develop other preliminary estimates for construction in a particular area.

Tables 3, 4, and 5 provide data useful in soils engineering. With the use of the soil map for identification, these interpretations can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depth of layers here reported. Even in these situations, however, the soil map is useful in planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the special terms used by soil scientists may not be familiar to the engineer, and some common terms may have special meanings in soil science. Several of these terms are defined in the Glossary. Additional information about the soils can be found in other sections of this survey, particularly the sections "Descriptions of the Soils" and "Formation and Classification of the Soils."

Engineering classification systems

Most highway engineers classify soil material according to the system approved by the American Association of State Highway Officials.[4] In this system soil materials are classified in seven principal groups. The groups range from A-1, in which are gravelly soils of high bearing capacity, to A-7, which consists of clay soils that have low strength when wet. In each group the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest.

Some engineers prefer the Unified classification system.[5] In this system the soils are grouped on the basis of their texture and plasticity, as well as on their performance when used as material for engineering structures. The soil materials are identified as coarse grained, which are gravel (G) and sand (S); fine grained, which are silt (M) and clay (C); and highly organic (Pt). Clean sands are identified by the symbols SW or SP; sands with fines of silt and clay, by the symbols SM and SC; silts and clays that have a low liquid limit, by the symbols ML and CL; and silts and clays that have a high liquid limit, by the symbols MH and CH.

Agricultural scientists of the U.S. Department of Agriculture (USDA) classify soils according to texture, color, and structure. This system is useful as the initial step in making engineering classifications of soils. Additional properties important in engineering can be estimated or can be determined by tests.

Test data

Table 3 shows the results of engineering tests performed by the Texas Highway Department on several important soils in Dickens County. The table shows the specific location where samples were taken, the parent material, the depth to which sampling was done, and the results of tests to determine particle-size distribution and other properties significant in soil engineering. Following are brief explanations of the headings in table 3.

As moisture leaves a soil, the soil decreases in volume in proportion to the loss in moisture, until a point is reached where shrinkage stops even though additional moisture is removed. The moisture content at which shrinkage stops is called the shrinkage limit. The shrinkage limit of a soil is a general indication of the clay content; it decreases as the clay content increases. In sand that contains little or no clay, the shrinkage limit is close to the liquid limit and is considered insignificant. As a rule, the load-carrying capacity of a soil is at a maximum when its moisture content is at or below the shrinkage limit. Sand does not follow this rule, because if it is confined, its load-carrying capacity is uniform within a considerable range in moisture content.

The shrinkage ratio is the volume change resulting from the drying of a soil material, divided by the loss of moisture caused by drying. The ratio is expressed numerically. The volume change used in computing shrinkage ratio is the change in volume that takes place in a soil when it dries from a given moisture content to a point where no further shrinkage takes place.

Lineal shrinkage is the decrease in one dimension, expressed as a percentage of the original dimension, of the soil mass when the moisture content is reduced from the stipulated percentage to the shrinkage limit.

In mechanical analysis the soil components are sorted by particle size. Sand and other granular material are retained on a No. 200 sieve, but finer particles pass through the openings. Clay is the fraction smaller than 0.002 millimeter in diameter. The material intermediate in size between that held on the No. 200 sieve and that having a diameter of 0.002 millimeter is mostly silt.

The tests for liquid limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Engineering properties of the soils

Table 4 gives estimates of soil properties that apply to engineering. These estimates were made on the basis of the test data shown in table 3, on field tests, and on experience with the same kinds of soils in Crosby, Childress, Foard, and Wilbarger Counties. Estimates are not given for Breaks-Alluvial land, Rock outcrop, and Rough broken land, because the properties are variable.

[4] AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Part 1, Ed. 8, 1961.

[5] WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS. UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo No. 3-357, v. 1, 1953.

TABLE 3.—*Engineering*

[Tests performed by Texas Highway Department in accordance with standard

Soil name and location	Parent material	Texas report No.	Depth from surface [1]	Shrinkage		
				Limit	Ratio	Lineal
			In.			
Olton clay loam:						
1.5 miles NW. of Gilpin and 150 feet N. of State Route 70 (Modal).	Moderately fine textured, calcareous sediments.	64-231-R	10-23	12	1. 95	14. 5
		64-232-R	33-52	16	1. 83	7. 2
		64-233-R	52-60	24	1. 57	3. 3
0.4 mile S. and 75 feet E. of NW. corner of sec. 268, Block 1 H&GN (Clayey B2 horizon).	Moderately fine textured, calcareous sediments.	64-234-R	6-22	10	2. 06	18. 0
		64-235-R	38-58	15	1. 87	10. 7
Weymouth clay loam:						
1.4 miles N. and 200 feet W. of Gilpin store (Modal).	Clayey and shaly Triassic red beds.	64-224-R	6-14	15	1. 84	9. 4
		64-225-R	14-26	17	1. 79	8. 6
		64-226-R	26-36	18	1. 73	7. 0
2,400 feet N. and 150 feet E. of SW. corner of sec. 365, Block 1, H&GN (Clayey AC horizon).	Clayey and shaly Triassic red beds.	64-236-R	8-12	11	2. 03	14. 0
		64-237-R	26-48	9	2. 07	17. 1
Woodward very fine sandy loam:						
0.52 mile E. of Pitchfork Ranch Headquarters and 200 feet N. of U.S. Highway No. 82 (No Cca horizon).	Sandy and silty Permian red beds.	64-229-R	12-30	17	1. 77	5. 0
		64-230-R	30-60	18	1. 74	3. 7

[1] The surface layer was not tested.

[2] Mechanical analysis according to AASHO Designation: T88-57, "Mechanical Analysis of Soils," in "Standard Specifications for Highway Materials and Methods of Sampling and Testing," pt. 2, Ed. 8 (1961) published by AASHO. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all th

TABLE 4.—*Estimated*

[Properties not estimated for Breaks-Alluvial land

Soil series and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASHO
	Inches			
Abilene: AbA.	0-13	Clay loam	CL	A-6
	13-38	Clay	CL	A-7
	38-64	Clay loam	CL	A-6
Berda: BmD, BpF. For properties of Mansker soil in BmD, see Mansker series; for properties of Potter soil in BpF, see Potter series.	0-10	Loam	SC or CL	A-6
	10-22	Loam	SC or CL	A-6
	22-60	Loam	SC or CL	A-6
Bippus: BuB.	0-28	Clay loam	CL	A-6
	28-48	Clay loam	CL	A-6
Brownfield: Bw. For properties of Nobscot soil, see Nobscot series.	0-25	Fine sand	SP-SM	A-2 or A-3
	25-52	Sandy clay loam	SC	A-2 or A-6
	52-58	Fine sandy loam	SM-SC	A-2, A-4, or A-6
Carey: CaB, CaC.	0-10	Loam	ML-CL	A-4
	10-38	Sandy clay loam	ML-CL or CL	A-4 or A-6
	38-60	Loam	ML-CL	A-4
Colorado: Cd.	0-6	Fine sandy loam	SM, SC or CL	A-4
	6-60	Sandy clay loam	SC or CL	A-6

test data

procedures of the American Association of State Highway Officals (AASHO)]

Mechanical analysis [2]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—						
1½ inch	¾ inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.			AASHO	Unified [3]
									Pct.			
----	----	----	100	98	89	80	43	38	42	26	A-7-6(15)	CL
----	100	94	91	89	84	71	32	25	30	16	A-6(10)	CL
100	96	95	94	93	90	63	12	9	30	6	A-4(8)	ML-CL
----	----	100	99	96	89	85	51	37	50	29	A-7-6(18)	CL
----	100	96	93	81	75	74	41	31	38	21	A-6(12)	CL
----	100	97	95	92	84	72	30	23	34	16	A-6(10)	CL
100	90	79	77	73	69	64	28	22	34	15	A-6(9)	CL
100	87	80	79	77	75	71	20	15	32	12	A-6(9)	CL
----	----	100	98	94	77	70	39	33	39	25	A-6(14)	CL
----	100	99	99	97	82	78	50	42	46	32	A-7-6(16)	CL
----	----	100	99	98	77	55	20	16	26	8	A-4(8)	CL
----	----	100	99	99	78	60	24	20	25	5	A-4(8)	ML-CL

material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[3] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification. An example of borderline classification obtained by this use is ML-CL.

engineering properties

complex, Rock outcrop, and Rough broken land]

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential	Hydrologic group
No. 4	No. 10	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH*		
----	100	60-70	0.2-0.8	0.20	6.6-7.8	Moderate	C
----	100	75-85	0.05-0.2	.20	7.4-7.8	High	
----	100	70-80	0.05-0.2	.15	7.9-8.4	Moderate	
95-100	95-100	40-55	0.8-2.5	.17	7.4-8.4	Moderate	B
95-100	95-100	40-55	0.8-2.5	.17	7.9-8.4	Moderate	
90-100	90-100	40-55	0.8-2.5	.10	7.9-8.4	Moderate	
95-100	90-100	55-70	0.8-2.5	.15	7.4-8.4	Moderate	B
95-100	85-100	55-65	0.8-2.5	.10	7.9-8.4	Moderate	
----	100	5-15	2.5-5.0	.07	6.1-7.3	Low	A
----	100	30-45	0.8-2.5	.13	6.1-7.3	Moderate	
----	100	25-40	2.5-5.0	.10	6.6-7.3	Low to moderate	
----	100	60-65	0.8-2.5	.17	6.6-7.8	Low to moderate	B
100	95-100	65-70	0.8-2.5	.17	6.6-7.8	Low to moderate	
100	95-100	60-65	0.8-2.5	.13	7.9-8.4	Low to moderate	
----	100	35-55	0.8-2.5	.13	7.4-8.4	Low	B
----	100	45-65	0.8-2.5	.15	7.4-8.4	Moderate	

TABLE 4.—*Estimated*

Soil series and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASHO
	Inches			
Cottonwood: CoB.	0–6	Loam	ML–CL or CL	A–4 or A–6
	6–60	Gypsum.		
Enterprise: EnB, EnC.	0–16	Very fine sandy loam	ML–CL or CL	A–4 or A–6
	16–72	Very fine sandy loam	ML–CL or CL	A–4 or A–6
Latom: LaD.	0–9	Gravelly loam	SC or SM	A–2
	9–12	Conglomerate.		
Lincoln:				
Lc.	0–30	Loamy fine sand	SM or SC	A–2
	30–60	Clay loam	CL	A–6
Ln.	0–60	Fine sand	SP–SM	A–2 or A–3
Lofton: Lo.	0–8	Clay loam	CL	A–6 or A–7
	8–64	Clay	CL or CH	A–7
	64–80	Clay	CL	A–6 or A–7
Mangum: Ma.	0–10	Clay loam	CL	A–6
	10–60	Clay	CL	A–7
Mansker: McB, McC.	0–8	Loam	CL	A–4
	8–16	Clay loam	CL	A–6
	16–66	Clay loam	CL	A–6
Meno:				
Md.	0–12	Fine sandy loam	SM–SC or SM	A–2
	12–40	Sandy clay loam	SC or CL	A–6
	40–80	Loam	SC or CL	A–2 or A–6
Me.	0–15	Loamy fine sand	SM–SC or SC	A–2
	15–40	Sandy clay loam	SC or CL	A–6
	40–62	Loam	SC or CL	A–2 or A–6
Miles:				
MfA, MfB, MfC, MfD, MsC2.	0–11	Fine sandy loam	SM–SC or SC	A–2
	11–52	Sandy clay loam	SC or CL	A–6
	52–60	Sandy clay loam	SC	A–6
MlB, MlC.	0–15	Loamy fine sand	SM or SC	A–2
	15–50	Sandy clay loam	SC or CL	A–6
	50–60	Sandy clay loam	SC or CL	A–6
Mobeetie: MtB, MtC.	0–10	Fine sandy loam	SM	A–2
	10–60	Loam	SM or SC	A–4 or A–6
Nobscot.	0–36	Fine sand	SP–SM	A–2 or A–3
	36–54	Fine sandy loam	SM–SC or SM	A–2
	54–72	Fine sand	SP–SM	A–2 or A–3
Olton: OcA, OcB.	0–9	Clay loam	CL	A–6
	9–33	Heavy clay loam	CL or CH	A–7
	33–52	Clay loam	CL–ML or CL	A–4 or A–6
Portales: PoA.	0–15	Loam, sandy clay loam	CL	A–6
	15–30	Sandy clay loam	SC or CL	A–6
	30–60	Sandy clay loam	SC or CL	A–6
Potter.	0–6	Loam	CL	A–6
	6–12	Caliche.		
Pullman: PuA, PuB.	0–8	Clay loam	CL	A–6
	8–44	Clay	CL or CH	A–6 or A–7
	44–70	Clay loam	CL	A–6 or A–7
Quinlan: Qc. For properties of Cottonwood soil, see Cottonwood series.	0–14	Very fine sandy loam	ML–CL or CL	A–4 or A–6
	14–24	Soft sandstone	SM or ML	A–4

engineering properties—Continued

Percentage passing sieve—			Permea-bility	Available water capacity	Reaction	Shrink-swell potential	Hydrologic group
No. 4	No. 10	No. 200					
			Inches per hour	*Inches per inch of soil*	*pH*		
100	95–100	85–90	0. 2–2. 5	. 12	7. 4–8. 4	Low to moderate	C
------------	100	75–80	0. 8–2. 5	. 15	6. 6–7. 8	Low to moderate	B
------------	100	75–80	0. 8–2. 5	. 13	7. 4–8. 4	Low to moderate	
80–90	75–85	25–35	0. 8–2. 5	. 10	6. 6–7. 8	Low	C
100	95–100	15–25	2. 5–5. 0	. 08	7. 4–8. 4	Low	A
------------	100	55–65	0. 2–0. 8	. 18	7. 4–8. 4	Moderate	
100	90–100	5–20	2. 5–5. 0	. 07	7. 4–8. 4	Low	A
------------	100	60–70	0. 2–0. 8	. 18	6. 6–7. 8	Moderate	D
------------	100	65–80	0. 05–0. 2	. 18	6. 6–7. 8	High	
------------	100	60–70	0. 05–0. 2	. 15	7. 4–8. 4	Moderate	
------------	100	60–70	0. 20–0. 8	. 20	7. 4–7. 8	Moderate	D
------------	100	75–85	0. 05–0. 8	. 20	7. 4–8. 4	Moderate	
95–100	95–100	50–60	0. 8–2. 5	. 17	7. 4–8. 4	Moderate	B
95–100	95–100	55–65	0. 8–2. 5	. 17	7. 9–8. 4	Moderate	
95–100	95–100	60–70	0. 8–2. 5	. 09	7. 9–8. 4	Moderate	
------------	100	20–35	0. 8–2. 5	. 13	6. 6–7. 3	Low	B
------------	100	35–55	0. 8–2. 5	. 15	6. 6–7. 8	Moderate	
------------	100	30–55	0. 8–2. 5	. 13	7. 4–8. 4	Moderate	
------------	100	20–30	0. 8–5. 0	. 08	6. 6–7. 3	Low	B
------------	100	35–55	0. 8–2. 5	. 12	6. 6–7. 8	Moderate	
------------	100	30–55	0. 8–2. 5	. 12	7. 4–8. 4	Moderate	
------------	100	20–35	0. 8–2. 5	. 13	6. 6–7. 8	Low	B
------------	100	45–60	0. 8–2. 5	. 13	6. 6–7. 8	Moderate	
90–100	90–100	35–50	0. 8–2. 5	. 12	7. 4–8. 4	Moderate	
------------	100	25–35	0. 8–5. 0	. 10	6. 6–7. 3	Low	B
------------	100	45–55	0. 8–2. 5	. 13	6. 6–7. 8	Low to moderate	
------------	100	45–55	0. 8–2. 5	. 13	7. 4–7. 8	Low to moderate	
95–100	90–100	15–25	0. 8–2. 5	. 13	7. 4–7. 8	Low	B
95–100	90–100	35–45	0. 8–2. 5	. 14	7. 4–8. 4	Low to moderate	
------------	100	5–15	2. 5–5. 0	. 07	6. 1–6. 5	Low	A
------------	100	20–35	2. 5–5. 0	. 10	6. 1–6. 5	Low	
------------	100	5–15	2. 5–5. 0	. 07	6. 6–7. 3	Low	
95–100	95–100	85–90	0. 2–0. 8	. 18	6. 6–7. 8	Moderate	C
90–100	90–100	85–90	0. 2–0. 8	. 18	6. 6–7. 8	Moderate to high	
90–100	90–100	75–90	0. 2–0. 8	. 13	7. 9–8. 4	Moderate	
95–100	95–100	50–65	0. 8–2. 5	. 15	7. 4–8. 4	Moderate	B
95–100	90–100	40–55	0. 2–0. 8	. 15	7. 4–8. 4	Low to moderate	
90–100	90–100	40–55	0. 8–2. 5	. 10	7. 9–8. 4	Low to moderate	
80–100	80–100	55–70	0. 8–2. 5	. 11	7. 4–7. 8	Moderate	C
------------	100	70–85	0. 05–0. 8	. 18	6. 6–7. 8	Moderate	D
95–100	90–100	75–85	0. 05–0. 2	. 18	6. 6–7. 8	Moderate to high	
95–100	90–100	70–80	0. 05–0. 2	. 13	7. 9–8. 4	Moderate	
------------	100	75–80	0. 8–2. 5	. 15	7. 4–7. 8	Low	B
------------	100	35–55	------------	. 10	7. 9–8. 4	Low	

TABLE 4.—*Estimated*

Soil series and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASHO
	Inches			
Randall:				
Ra.	0–10	Clay	CL	A–7
	10–60	Clay	CL or CH	A–7
Rf.	0–15	Fine sandy loam	SM-SC	A–6
	15–60	Clay	CL or CH	A–7
Spur:				
Sp.	0–40	Clay loam	CL	A–6
	40–60	Fine sandy loam	SM or SC	A–4 or A–6
Sr.	0–8	Fine sandy loam	SM or SC	A–4 or A–6
	8–40	Clay loam	CL	A–4 or A–6
	40–64	Fine sandy loam	SM or SC	A–4 or A–6
Stamford: StB.	0–34	Clay	CL or CH	A–7
	34–60	Clay	CL or CH	A–7
Tillman: TlA, TlB.	0–6	Clay loam	CL	A–6
	6–41	Clay	CL or CH	A–6 or A–7
	41–63	Silty clay loam	CL	A–6
Veal: VeB, VeC.	0–7	Fine sandy loam	SM-SC	A–4 or A–6
	7–16	Sandy clay loam	CL	A–6
	16–48	Sandy clay loam	CL	A–6
Vernon: VnD, Vr. Properties not estimated for Badland part of Vr.	0–7	Clay loam	CL	A–6
	7–15	Clay	CL or CH	A–6 or A–7
	15–60	Clay	CL or CH	A–6 or A–7
Weymouth: WeB, WeC.	0–14	Clay loam	CL	A–6
	14–26	Clay loam	CL	A–6
	26–36	Loam.		
Woodward: WoB, WoC, WuE. For properties of Quinlan soil in WuE, see Quinlan series.	0–26	Loam	CL-ML or CL	A–4 or A–6
	26–36	Soft sandstone	CL-ML	A–4
Yahola: Ya.	0–15	Very fine sandy loam	ML	A–4
	15–60	Very fine sandy loam	ML	A–4

TABLE 5.—*Interpretations*

[No interpretations for Breaks-Alluvial land

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Farm ponds	
				Reservoir area	Embankment
Abilene: AbA	Fair	Poor: moderate to high shrink-swell potential.	Moderate to high shrink-swell potential.	All features favorable.	Fair stability
Berda: BmD, BpF. For interpretations of Mansker soil in BmD, see Mansker series; for interpretations of Potter soil in BpF, see Potter series.	Fair	Poor to fair: moderate shrink-swell potential.	All features favorable.	Calcareous substratum; pervious material.	Fair stability; pervious material.

engineering properties—Continued

Percentage passing sieve—			Permea-bility	Available water capacity	Reaction	Shrink-swell potential	Hydrologic group
No. 4	No. 10	No. 200					
			Inches per hour	*Inches per inch of soil*	pH		
	100	80–90	0. 05–8. 0	. 18	7. 9–8. 4	High	D
	100	80–90	<0. 05	. 18	7. 9–8. 4	High	
	100	40–50	0. 2–0. 8	. 13	7. 9–8. 4	Low to moderate	D
	100	80–90	<0. 05	. 18	7. 9–8. 4	High	
	100	55–65	0. 8–2. 5	. 17	7. 9–8. 4	Moderate	B
	100	35–45	0. 8–2. 5	. 10	7. 9–8. 4	Low to moderate	
	100	35–45	0. 8–2. 5	. 13	7. 4–8. 4	Low to moderate	B
	100	55–65	0. 8–2. 5	. 17	7. 4–8. 4	Moderate	
	100	35–45	0. 8–2. 5	. 10	7. 9–8. 4	Low to moderate	
	100	80–90	<0. 05	. 18	7. 4–8. 4	High	D
	100	80–90	<0. 05	. 18	7. 9–8. 4	High	
	100	80–90	0. 2–0. 8	. 18	7. 4–8. 4	Moderate to high	D
	100	80–90	<0. 05	. 18	7. 9–8. 4	High	
	100	80–90	0. 05–0. 2	. 13	7. 9–8. 4	Moderate to high	
95–100	95–100	40–50	0. 8–2. 5	. 12	7. 4–8. 4	Low	B
95–100	95–100	50–60	0. 8–2. 5	. 15	7. 4–8. 4	Moderate	
95–100	95–100	50–60	0. 8–2. 5	. 07	7. 9–8. 4	Moderate	
100	95–100	55–65	0. 2–0. 8	. 17	7. 4–7. 8	Moderate	D
100	95–100	60–70	0. 05–0. 2	. 18	7. 4–7. 8	Moderate to high	
100	95–100	60–70	0. 05–0. 2	. 18	7. 9–8. 4	Moderate to high	
95–100	95–100	75–85	0. 8–2. 5	. 15	7. 4–8. 4	Moderate	C
80–100	75–95	65–85	0. 2–0. 8	. 12	7. 9–8. 4	Moderate	
95–100	95–100	75–85	0. 8–2. 5	. 12	7. 4–8. 4	Low to moderate	B
95–100	95–100	75–85	0. 8–2. 5	. 10	7. 9–8. 4	Low to moderate	
	100	60–65	0. 8–2. 5	. 12	7. 4–8. 4	Low to moderate	B
	100	60–65	2. 5–5. 0	. 12	7. 4–9. 0	Low to moderate	

of engineering properties

complex, Rock outcrop, and Rough broken land]

Soil features affecting—Continued				Soil limitations for sewage disposal
Irrigation	Terraces and diversions	Grassed waterways	Building foundations	Septic tank filter fields
Low intake rate	All features favorable	Deep cuts expose dense, clayey material.	High shrink-swell potential in subsoil.	Severe: slow permeability.
Steep slopes	Undulating topography	All features favorable	All features favorable	Slight: no limiting factors.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Farm ponds	
				Reservoir area	Embankment
Bippus: BuB	Fair	Fair: moderate shrink-swell potential	All features favorable.	Calcareous substratum.	Fair stability
Brownfield: Bw For interpretations of Nobscot soil, see Nobscot series.	Poor	Fair: binder needed.	Loose sand hinders hauling operations.	Sandy substratum	Sandy, highly pervious material; slopes unstable unless protected.
Carey: CaB, CaC	Fair	Fair: low to moderate shrink-swell potential.	High erodibility when exposed on embankments.	Gypsum in substratum.	Fair stability; pervious material.
Colorado: Cd	Fair	Fair: material high in very fine sand.	Susceptibility to flooding.	Stratified substratum.	Fair stability; pervious material.
Cottonwood: CoB	Poor	Fair: material high in very fine sand.	Substratum dissolves in water.	High gypsum content.	Susceptibility to piping; highly pervious material.
Enterprise: EnB, EnC	Good	Fair: material high in silt.	High erodibility when exposed on embankments.	Pervious material	Erodible, pervious material.
Latom: LaD	Poor	Good	Stones hinder hauling and grading operations.	Seepage potential	Limited volume of material; highly pervious material.
Lincoln:					
Lc	Poor	Very good when confined: binder needed.	Loose sand hinders hauling operations; subject to occasional flooding.	Sandy material; seepage potential.	Fair stability when confined; highly pervious material.
Ln	Poor	Fair to good if soil binder added.	Loose sand hinders hauling operations; subject to occasional flooding.	Sandy material; seepage potential.	Sandy, highly pervious material.
Lofton: Lo	Fair	Poor: high shrink-swell potential in subsoil.	High shrink-swell potential in subsoil.	All features favorable.	Fair stability
Mangum: Ma	Fair	Poor: moderate shrink-swell potential.	Highly plastic substratum.	All features favorable.	Fair stability
Mansker: McB, McC	Fair	Fair: material high in very fine sand.	All features favorable.	Calcareous substratum; seepage potential.	Fair stability; pervious material.
Meno:					
Md	Fair to good.	Good	All features favorable.	Sandy material; seepage potential.	Fair stability; pervious material.
Me	Poor	Good	All features favorable.	Sandy material; seepage potential.	Fair stability when confined; highly pervious material.
Miles:					
MfA, MfB, MfC, MfD, MsC2.	Fair to good.	Good	All features favorable.	Sandy material; seepage potential.	Fair stability; pervious material.
MlB, MlC	Fair	Good	All features favorable.	Sandy material; seepage potential.	Fair stability when confined; highly pervious material.

engineering properties—Continued

Soil features affecting—Continued				Soil limitations for sewage disposal
Irrigation	Terraces and diversions	Grassed waterways	Building foundations	Septic tank filter fields
All features favorable	All features favorable	All features favorable	Moderate shear strength.	Slight to moderate: moderate permeability.
Low water-holding capacity in surface layer; high intake rate.	Susceptibility to soil blowing; undulating terrain.	Sandy material; high erodibility.	Good bearing capacity if confined.	Slight.
All features favorable	Outlets unstable	All features favorable	Poor to fair bearing capacity.	Slight.
Complex slopes; susceptibility to flooding.	Susceptibility to flooding	High siltation of channels from overflow.	Fair to good bearing capacity.	Severe: occasional flooding.
Low water-holding capacity.	Shallowness to gypsum	Shallowness to gypsum	Poor bearing capacity	Severe: shallowness to gypsum.
High intake rate	Outlets unstable	High erodibility	Poor to fair bearing capacity.	Slight.
Shallowness to sandstone; low water-holding capacity.	Shallowness to sandstone	Shallowness to sandstone	All features favorable	Slight to moderate: shallowness to hard rock.
High intake rate; low water-holding capacity.	Susceptibility to flooding and soil blowing.	Not applicable	Good bearing capacity if confined.	Severe: occasional flooding.
High intake rate; very low water-holding capacity.	Susceptibility to flooding and soil blowing.	Not applicable	Good bearing capacity if confined.	Severe: occasional flooding.
Low intake rate	All features favorable	Deep cuts expose clayey material.	High shrink-swell potential in subsoil.	Severe: slow permeability.
Low intake rate	Susceptibility to flooding	Deep cuts expose clayey material.	Fair bearing capacity; moderate shrink-swell potential in subsoil.	Severe: occasional flooding.
Low water-holding capacity.	Caliche within depth of 20 inches.	Deep cuts may expose caliche.	Fair to good bearing capacity.	Slight: no limiting factors.
High intake rate	All features favorable	All features favorable	Fair to good bearing capacity.	Slight: no limiting factors.
High intake rate	High susceptibility to soil blowing.	High siltation of channels from soil blowing.	All features favorable	Slight: no limiting factors.
High intake rate; complex slopes.	Complex slopes	All features favorable	All features favorable	Slight: no limiting factors.
High intake rate	Complex slopes	High erodibility	All features favorable	Slight: no limiting factors.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Farm ponds	
				Reservoir area	Embankment
Mobeetie: MtB, MtC	Fair	Good	All features favorable.	Calcareous material; seepage potential.	Fair stability; pervious material.
Nobscot	Poor	Fair to good if soil binder added.	Loose sand hinders hauling operations.	Sandy material; seepage potential.	Sandy material; poor to fair stability; highly pervious material.
Olton: OcA, OcB	Fair to good.	Fair: moderate to high shrink-swell potential.	Moderate to high shrink-swell potential.	All features favorable.	Fair stability
Portales: PoA	Poor to fair.	Fair: low to moderate shrink-swell potential.	All features favorable.	Calcareous material; seepage potential.	Fair stability; pervious material.
Potter	Poor	Fair: stable below surface layer.	Hard caliche within depth of 4 to 10 inches.	Caliche rock in substratum.	Poor to fair stability.
Pullman: PuA, PuB	Fair to good.	Poor: moderate to high shrink-swell potential.	Moderate to high shrink-swell potential.	All features favorable.	Fair stability; impervious material.
Quinlan (Qc) For interpretations of Cottonwood soil, see Cottonwood series.	Poor	Fair: material high in silt.	Soft sandstone within depth of 4 to 20 inches.	Gypsum in substratum.	Limited fill material; pervious material.
Randall:					
Ra	Fair	Poor: high shrink-swell potential.	High shrink-swell potential.	All features favorable.	Poor stability
Rf	Fair	Poor to fair: low to high shrink-swell potential.	Low to high shrink-swell potential.	All features favorable.	Poor stability
Spur:					
Sp	Good	Fair: low to moderate shrink-swell potential.	Occasional flooding	Sandy substratum	Fair stability; pervious material.
Sr	Good	Fair: low to moderate shrink-swell potential.	Occasional flooding	Seepage; sandy substratum.	Fair stability: pervious material.
Stamford: StB	Poor to fair.	Poor: high shrink-swell potential.	High shrink-swell potential.	All features favorable.	Poor stability; good core material.
Tillman: TlA, TlB	Fair	Poor to fair: moderate to high shrink-swell potential.	Moderate to high shrink-swell potential.	All features favorable.	Poor to fair stability.
Veal: VeB, VeC	Fair	Fair: moderate shrink-swell potential in subsoil.	All features favorable.	Calcareous substratum; seepage potential.	Fair stability; pervious material.
Vernon: VnD, Vr Interpretations not given for Badland part of Vr.	Poor	Poor to fair: moderate to high shrink-swell potential.	Moderate to high shrink-swell potential.	All features favorable.	Poor stability; good core material.
Weymouth: WeB, WeC	Fair	Fair: moderate shrink-swell potential.	All features favorable.	All features favorable.	Fair stability

engineering properties—Continued

Soil features affecting—Continued				Soil limitations for sewage disposal
Irrigation	Terraces and diversions	Grassed waterways	Building foundations	Septic tank filter fields
High intake rate	Complex slopes	High erodibility	All features favorable	Slight: no limiting factors.
Low water-holding capacity; high intake rate.	High susceptibility to soil blowing; undulating terrain.	High susceptibility to soil blowing; low productivity.	Good bearing capacity if confined.	Slight: no limiting factors.
Low intake rate	All features favorable	Deep cuts expose dense, clayey material.	Fair to poor stability	Severe: slow permeability.
All features favorable	All features favorable	All features favorable	Fair to good stability	Slight: no limiting factors.
Low water-holding capacity; shallowness to caliche.	Shallowness to caliche	Shallowness; hard to establish vegetation.	Good stability in substratum.	Moderate: shallowness to caliche.
Low intake rate	All features favorable	Deep cuts expose dense, clayey materials.	Moderate to high shrink-swell potential in subsoil.	Severe: slow permeability.
Low water-holding capacity.	Shallowness to soft sandstone.	Shallowness to soft sandstone.	Fair bearing capacity	Slight to moderate: shallowness to soft sandstone.
Low intake rate	Not applicable	Not applicable	High shrink-swell potential.	Severe: flooding and very slow permeability.
Low intake rate	Not applicable	Not applicable	Low to high shrink-swell potential.	Severe: flooding and very slow permeability.
Occasional flooding	Occasional flooding	Occasional flooding	Occasional flooding; moderate shear strength.	Severe: occasional flooding.
Occasional flooding	Occasional flooding	Occasional flooding	Occasional flooding; moderate shear strength.	Severe: occasional flooding.
Low intake rate	Susceptibility to cracking.	Cuts expose clayey material.	High shrink-swell potential; low bearing capacity.	Severe: slow permeability.
Low intake rate	All features favorable	Cuts expose clayey material.	High shrink-swell potential in subsoil; low bearing capacity.	Severe: slow permeability.
Low water-holding capacity.	Shallowness to caliche	Cuts expose caliche material.	Moderate shrink-swell potential in subsoil.	Slight: no limiting factors.
Very low intake rate	All features favorable	Shallowness; cuts expose clayey material.	Moderate to high shrink-swell potential.	Severe: slow permeability.
Moderate water-holding capacity.	All features favorable	All features favorable	Fair stability	Severe: shallowness to dense red beds.

TABLE 5.—*Interpretatio*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Farm ponds	
				Reservoir area	Embankment
Woodward: WoB, WoC, WuE. For interpretations of Quinlan soil in WuE, see Quinlan series.	Fair	Fair: low to moderate shrink-swell potential.	High erodibility when exposed on embankments.	Seepage potential; gypsum in substratum.	Fair stability; per vious material.
Yahola: Ya	Fair	Fair: material high in very fine sand.	Occasional flooding	Sandy; seepage potential.	Susceptibility to piping; highly pervious materi

Permeability, as used in table 4, relates only to movement of water downward through undisturbed and uncompacted soil. It does not include lateral seepage. The estimates are based on structure and porosity of the soil. Plowpans, surface crusts, and other properties resulting from use of the soils are not considered.

Available water capacity is the amount of capillary water that is held in the soil and is available to plants after all free water has drained away.

Reaction is the degree of acidity or alkalinity of a soil, expressed as a pH value. The pH value, and relative terms used to describe soil reaction, are explained in the Glossary.

Shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates hazards to the maintenance of structures constructed in, on, or with such material.

Soils are placed in one of four hydrologic groups on the basis of intake of water at the end of a long-duration storm, after prior wetting and swelling and without the protection of vegetation. Group A consists of deep sands that contain very little silt and clay and deep, rapidly permeable loessal soils. These soils soak up the most rain and have the least runoff. Group B consists mostly of sandy soils that are less deep than the soils in group A and loessal soils that are less deep or less well aggregated. Soils in this group absorb more water than average, even after they are thoroughly wet. Group C consists of shallow soils and soils that contain large amounts of clay and colloidal particles but smaller amounts than the soils in group D. Group C soils absorb less water than average after being thoroughly wet. Group D consists mostly of clays that increase greatly in volume when they absorb water but partly of shallow soils that have nearly impermeable layers near the surface. Soils in group D soak up the least rain and lose the most as runoff. The entire soil profile was considered in rating the soils of this county by hydrologic groups.

Engineering interpretations of the soils

The first part of table 5 gives estimates of the suita ity of the soils as a source of topsoil and road fill. ' last two parts list soil features that affect specified e neering uses. The estimates are based on the data sh in tables 3 and 4 and on observations of field perfo ance of the soils. Interpretations are not included table 5 for Breaks-Alluvial land complex, Rock crop, and Rough broken land, all of which have varia characteristics.

Topsoil is a term used to designate a fertile soil or material, ordinarily rich in organic matter, used a topdressing for roadbanks, dams, disturbed areas, ga ens, lawns, and the like. Normally, only the surf layer is used, but other layers also may be suita Loamy and fertile soils, such as Spur soils, are rated a good source of topsoil. Very shallow and grav soils, such as Potter soils, are rated as a poor source.

Road fill is soil material used to build embankme The suitability of a soil for road fill depends larg on texture, plasticity, shrink-swell potential, traffic-s porting capacity, inherent erodibility, compaction ch acteristics, and natural water content. Clayey soils t have a high shrink-swell potential, such as Randall c and Stamford clay, are rated poor as a source of r fill because they are difficult to place and to compact.

Most of the soils in this county are not suitable a source of sand or gravel, but some such material can found in areas of Latom soils and in creekbeds.

Shrink-swell potential, erodibility, and flooding important factors in determining the suitability o soil for highways. Stamford clay and Randall clay examples of soils that contain plastic clay layers a have high shrink-swell potential. Such soils are poor highway locations and are very poor for use as subgr material.

Spur clay loam and other soils that are occasiona flooded are not suitable as sites for reservoirs, nor Mansker and Potter soils, which have a caliche subst tum that permits water seepage. Unstable soils, such Stamford clay and Randall clay, are poor soils for

engineering properties—Continued

Soil features affecting—Continued				Soil limitations for sewage disposal
Irrigation	Terraces and diversions	Grassed waterways	Building foundations	Septic tank filter fields
Low water-holding capacity; some slopes too steep for gravity systems.	Complex slopes; outlets unstable.	High erodibility	Fair stability	Slight: no limiting factors.
Low water-holding capacity; high intake rate.	Susceptibility to flooding and soil blowing.	Susceptibility to flooding and soil blowing.	Occasional flooding	Severe: occasional flooding.

in embankments, because they crack when dry and have a high shrink-swell potential. Additional limitations of soils for farm ponds are stoniness, shallowness to bedrock, and high permeability.

The suitability of soils for irrigation depends largely on the intake rate, water-holding capacity, depth and slope of soil, susceptibility to water erosion, and susceptibility to flooding. Irrigation is risky on Mansker loam, for example, because this soil is shallow and has low water-holding capacity.

Soil features that affect the suitability of a soil for terraces or diversions are texture, slope, depth to bedrock or other unfavorable material, and stability. Field terraces constructed on erodible, sandy soils are difficult to build and maintain. One such soil is Miles loamy fine sand, which is highly susceptible to soil blowing. As another example, diversion terraces built on Spur clay loam may be damaged or destroyed by floodwaters.

Grassed waterways are constructed to carry off excess water that is discharged from terraces, diversions, and other areas. Shallowness to caliche or sandstone adversely affects the construction of waterways because the soils tend to be droughty and the vegetation is difficult to establish and maintain. Mansker soils and Quinlan soils are examples of soils that are shallow to caliche or sandstone. Frequent flooding also is a hazard in maintaining the grass in waterways.

In evaluating soils for building foundations, the factors of most importance are slope, depth, flood hazard, shrink-swell potential, bearing capacity, and corrosion potential. The interpretations in this table relate to buildings that are not more than three stories high and that require a bearing value of no more than 6,000 pounds per square foot. Examples are buildings suitable for stores, offices, and light industry. It is assumed that public or community sewage disposal facilities are available. Tillman soils and Stamford soils have high shrink-swell potential in the subsoil and low bearing capacity, both of which are properties unfavorable for building foundations. No specific values should be inferred from the estimates of bearing capacity given in this column.

Winter grading and frost action are not problems in this county, because the soils generally have a low moisture content during winter and periods of subfreezing temperatures are fairly short. Dispersion is not a problem in the clay soils in Dickens County. Nor is agricultural drainage a problem.

For an efficient sewage disposal system, the soil material must be permeable enough to absorb sewage and to permit moderate to rapid percolation of effluent. Subsurface tile is laid in such a way that effluent from the septic tank is uniformly distributed through the soil. Randall soils are examples of those severely limited as filter fields because of the hazard of flooding, very slow percolation, and high shrink-swell potential.

Formation and Classification of the Soils

This section discusses the five factors of soil formation and the processes of horizon differentiation. It also classifies the soils by higher categories (see table 6).

Formation of the Soils

The five major factors of soil formation are climate, living organisms (especially vegetation), parent material, relief, and time. The kind of soil that forms in one area differs from the kind of soil in another area if there has been a difference between the two areas in one or more of the major factors.

Climate

The climate of Dickens County is warm and subhumid. Presumably, the present climate is similar to the climate that existed when the soils were formed. It is uniform, but its effects have been modified locally by relief and runoff. Because rainfall is low and there are long, dry periods, soil development is slow. The soils are seldom wet below the root zone, and as a result, many have a horizon of calcium carbonate accumulation. Leaching has

TABLE 6.—*Classification of soil series*

Series	Family	Subgroup	Order
Abilene	Fine, mixed, thermic	Pachic Argiustolls	Mollisols.
Berda	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Bippus	Fine-loamy, mixed, thermic	Pachic Haplustolls	Mollisols.
Brownfield	Loamy, mixed, thermic	Arenic Paleustalfs	Alfisols.
Carey	Fine-silty, mixed, thermic	Typic Argiustolls	Mollisols.
Colorado	Fine-loamy, mixed, calcareous, thermic	Typic Ustifluvents	Entisols.
Cottonwood	Fine-carbonatic, thermic, shallow	Ustic Torriorthents	Entisols.
Enterprise	Coarse-silty, mixed, thermic	Typic Ustochrepts	Inceptisols.
Latom	Loamy, mixed, calcareous, thermic	Lithic Ustic Torriorthents	Entisols.
Lincoln	Sandy, mixed, thermic	Typic Ustifluvents	Entisols.
Lofton	Fine, mixed, thermic	Pachic Argiustolls	Mollisols.
Mangum	Fine, mixed, calcareous, thermic	Vertic Ustifluvents	Entisols.
Mansker	Fine-carbonatic, thermic	Typic Calciustolls	Mollisols.
Meno [1]	Loamy, mixed, thermic	Aquic Arenic Haplustalfs	Alfisols.
Miles	Fine-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Mobeetie	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Nobscot	Loamy, mixed, thermic	Arenic Haplustalfs	Alfisols.
Olton	Fine, mixed, thermic	Typic Paleustolls	Mollisols.
Portales	Fine-carbonatic, thermic	Typic Calciustolls	Mollisols.
Potter	Fine-carbonatic, thermic, shallow	Ustollic Calciorthids	Aridisols.
Pullman	Fine, mixed, thermic	Pachic Paleustolls	Mollisols.
Quinlan	Loamy, mixed, thermic, shallow	Typic Ustochrepts	Inceptisols.
Randall	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Spur	Fine-loamy, mixed, thermic	Fluventic Haplustolls	Mollisols.
Stamford	Fine, montmorillonitic, thermic	Typic Chromusterts	Vertisols.
Tillman	Fine, mixed, thermic	Typic Paleustolls	Mollisols.
Veal	Fine-carbonatic, thermic	Typic Ustochrepts	Inceptisols.
Vernon	Fine, mixed, thermic	Typic Ustochrepts	Inceptisols.
Weymouth	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Woodward	Coarse-silty, mixed, thermic	Typic Ustochrepts	Inceptisols.
Yahola	Coarse-loamy, mixed, calcareous, thermic	Typic Ustifluvents	Entisols.

[1] Due to modification in the Comprehensive Classification scheme shortly before the survey was sent to the printer, these soils are excluded from the Meno series. They would now be classified in a fine-loamy, mixed, thermic family of Pachic Haplustolls. A new series has not been proposed for these soils.

not removed free lime from the upper layers of Mansker, Veal, or the other young soils.

Living organisms

Plants, micro-organisms, earthworms, and other forms of animal life are important in the formation of soils. The kinds and amounts of plants are determined partly by the climate and parent material. The vegetation in this county is mostly grass, but there are some brushy plants and small hardwood trees. The grasses are tall or short, depending on the kind of parent material. Brownfield and Nobscot soils, which have sandy parent material, support tall grasses; Olton clay loam, which has a parent material much higher in clay content, supports short grasses.

The prairie type of vegetation contributes large amounts of organic matter to the soil. Grass leaves and stems fall on the surface, decay, and darken the surface soil. Roots decompose and distribute organic matter throughout the solum and provide abundant food for earthworms and micro-organisms. As an example of the importance of earthworms, about 50 percent of the B2 horizon of the Portales soils consists of worm casts. Prairie dogs and other rodents offset the leaching of soluble minerals and destroy soil structure.

Man also has influenced soil formation by fencing the range and allowing it to be overgrazed, changing the vegetation, and clearing and plowing the soils for crops. He has clean harvested the crops and has not controlled runoff and soil blowing. Because of these practices, organic matter has been depleted and silt and clay particles have been blown from the plow layer. Heavy machinery and untimely tillage have compacted the soils and have slowed the infiltration of water and air. Irrigation has drastically changed the natural moisture regime in some areas.

Parent material

The soils of the High Plains, mostly Pullman soils, developed in moderately fine textured eolian sediments. They developed more rapidly than the sandier soils below the High Plains.

The soils of the Rolling Plains developed from five different kinds of parent material: (1) ancient alluvial outwash, (2) shale and clay from the Triassic red beds, (3) sandstone and packsand from the Permian red beds, (4) recent deposits of alluvium, and (5) wind-laid sand.

Miles and Abilene soils are among those that developed from a fairly thick mantle of ancient alluvial outwash. These soils cover large areas. Scattered areas of Vernon and Weymouth soils are examples of those that developed from Triassic shale and clay. Many of the soils in the eastern part of the county developed from Permian sandstone and packsand. Examples are Quinlan and Woodward soils. Spur and Yahola soils, which are on the flood plains of the major creeks, are examples of soils

that developed from recent alluvium. Brownfield and Nobscot are the main soils that developed in wind-laid sand. These soils make up large areas in the northeastern part of the county.

Relief

Relief influences soil development through its effects on drainage and runoff. If other factors of soil development are equal, the degree of profile development depends on the amount of water that enters a soil. For example, Mansker and Veal soils, which are on uplands, absorb less moisture and normally have a less well-developed profile than Miles soils, which are on flats. In addition, the formation of steep soils is retarded by continuous erosion.

Relief also affects the kind and amount of vegetation on a soil, but it is of little importance in Dickens County. Soils on north-facing slopes receive less sunlight than those on south-facing slopes and consequently lose less moisture through evaporation. As a result, those on north slopes have the densest vegetation and generally are the more strongly developed. For the same reason, soils that face east are better developed than those that face west.

Time

The characteristics of a soil are determined mainly by the length of time that the soil-forming factors have been active. A long time generally is required for the formation of well-defined, genetically related horizons. Miles and Olton soils are examples of those soils that have been in place a long time and have approached equilibrium with their environment. They are mature, or old, soils and show marked horizon differentiation. Examples of young soils that have a weakly developed profile are Spur soils on bottom land and Berda soils, which occur on alluvial fans below the caprock escarpment.

Processes of Horizon Differentiation

The processes involved in the formation of soil horizons in Dickens County are (1) accumulation of organic matter, (2) leaching of calcium carbonates and bases, and (3) formation and translocation of silicate clay minerals. More than one of these processes has been active in most soils.

The accumulation of organic matter in the upper part of the profile has been important in the formation of an A1 horizon. The soils of Dickens County are generally low in organic-matter content because the matter decomposes rapidly.

Nearly all the soils of this county have been leached, to some degree, of carbonates and bases. Some soil scientists agree that the removal of bases precedes the translocation of silicate clay minerals. This leaching has contributed to the development of horizons. For example, Miles soils have been leached of most carbonates and show distinct horizons. In contrast, Berda soils have not been leached and do not show distinct horizons.

The translocation of clay minerals has also contributed to horizon development in Dickens County. The eluviated A horizon of some soils is lower in clay content than the B horizon, though the B horizon usually has an accumulation of clay in pores and on ped surfaces. In the soils of this county, leaching of carbonates and soluble salts and the translocation of silicate clays are among the more important processes in horizon differentiation. Miles soils are examples of those in which silicate clays have accumulated in the B horizon.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationship to one another and to the whole environment, and understand their behavior and their response to manipulation. First through classification and then through use of the soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The current system of classification was adopted by the National Cooperative Soil Survey, effective March 1967. The system has six categories. Beginning with the most inclusive, the categories are the order, the suborder, the great group, the subgroup, the family, and the series. The placement of some soil series in the current system, particularly in families, may change as more precise information becomes available. Readers interested in the development of the system should refer to the latest literature available[6, 7]. Table 6 shows the classification of the soils in this county according to the family, subgroup, and order.

Additional Facts About the County

Plains Indians were about the only inhabitants of this county until buffalo hunters arrived in the 1860's. Cattlemen soon followed and organized several cattle ranches. By 1909, much of the land had been settled and was in cultivation.

Dickens County was organized in 1891. The 1960 Census showed a total population of 4,963.

Climate[8]

Dickens County has a warm-temperate, subtropical climate characterized by dry winters and summers with low humidity. Table 7 presents data on average and extreme temperatures and average and extreme amounts of rain, snow, and sleet. These data are from records kept at Spur.

The temperatures are extremely variable, especially during the colder months. From November through March, frequent cold fronts bring rapid and pronounced changes, but cold spells rarely last more than 48 hours. Strong, fast-moving cold fronts late in spring at times follow several weeks of mild weather. The average daily minimum temperature in January, the coldest month, is

[6] SIMONSON, ROY W. SOIL CLASSIFICATION IN THE UNITED STATES. Science, v. 137, No. 3535, pp. 1027-1034, illus., 1962.

[7] UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM. 7TH APPROXIMATION. Soil Surv. Staff, Soil Cons. Serv., 1960. [Amendment issued March 1967]

[8] Prepared by ROBERT B. ORTON, State climatologist, Weather Bureau, U.S. Department of Commerce.

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TABLE 7.—*Temperature*

[From records kept at the Weather

Month	Temperature											Average heating degree days [3]
	Average daily maximum	Average daily minimum	Monthly average	Record high [1]	Year of occurrence	Record low [1]	Year of occurrence	Average number of days with [2]—				
								Maximum temperature of—		Minimum temperature of—		
								90° F. or above	32° F. or below	32° F. or below	0° F. or below	
	° F.	*° F.*	*° F.*	*° F.*		*° F.*						
January	57.2	26.1	41.7	85	1953	−10	1947	0	2	25	(4)	735
February	62.3	30.1	46.2	91	1946	−17	1933	(4)	1	17	0	508
March	70.6	35.7	53.2	102	1946	−3	1943	1	(4)	12	0	394
April	79.9	46.3	63.1	103	1959 [6]	20	1954	9	0	2	0	127
May	86.5	53.6	70.1	108	1952	32	1960 [6]	15	0	(4)	0	26
June	94.0	64.5	79.3	114	1924	43	1947	22	0	0	0	2
July	96.3	67.3	81.8	111	1916	51	1915	28	0	0	0	0
August	96.7	66.0	81.4	111	1936	45	1915	29	0	0	0	0
September	88.8	59.1	74.0	106	1953	36	1912	19	0	0	0	6
October	79.5	48.8	64.2	99	1951 [6]	20	1917	5	0	1	0	99
November	66.4	35.6	51.0	93	1945	10	1916 [6]	0	0	11	0	420
December	58.9	29.4	44.2	87	1955 [6]	−2	1924	0	1	20	0	644
Year	78.1	46.9	62.5	114	1924	−17	1933	128	4	88	0	2,961

[1] Period of record 1911–63.
[2] Period of record 1954–63.
[3] Calculated from a base of 65° F.

about 26° F., and the average daily maximum temperature is slightly more than 96° in July and in August. April 4 is the average date of the last temperature of 32° or lower in spring, and November 7 is the average date of the first in fall. The average length of the growing season is 217 days.

The average annual precipitation is 20.43 inches, but the monthly and annual amounts vary widely. For example, 6.99 inches of rain fell in 1956, and 42.87 inches fell in 1941. About three-fourths of the precipitation falls during the months of May through October. Rainfall generally is heaviest in May and June when moist, tropical air carried far inland from the Gulf of Mexico produces moderate to heavy afternoon and evening thunderstorms. Rainfall is next heaviest in September when cold fronts, which are absent in summer, begin to clash with the tropical air. Periods of low rainfall are fairly common. Less than 13 inches falls in 1 year out of 10.

Precipitation is fairly light in winter, since frequent surges of dry polar air from the north effectively cut off the moist air from the Gulf. Light snows fall occasionally during winter, and exceptionally heavy snows fall in some years. Years of unusually heavy snow are shown in the last column of table 7.

Severe windstorms or hailstorms at times accompany heavy thunderstorms, especially late in spring and early in summer. Heavy rainfall causes excessive runoff and erosion and consequently is of little benefit. Crop damage resulting from wind, hail, and rain is fairly well localized.

Winds are strongest during intense thunderstorms but are of short duration. The strongest continuous winds, which generally are from the southwest, occur during February, March, and April. They often cause severe duststorms early in spring.

The escarpment in the northwestern part of Dickens County has a pronounced influence on the weather, especially in winter when the wind is from the east or southeast. Clouds and drizzle increase as cold air masses cross the escarpment.

The sun shines on an average of 70 to 75 percent of the possible hours. The relative humidity is between 75 and 80 percent at 6:00 a.m., between 45 and 50 percent at noon, between 40 and 45 percent at 6:00 p.m., and between 65 and 70 percent at midnight.

The average annual rate of pan evaporation [9] is 100 inches, and the average annual rate of lake evaporation is between 68 and 70 inches.

Geology

About 200 million years ago a shallow sea covered the area that is now the Panhandle of Texas. Marine sediments that were deposited during this period formed the Permian red beds, which are the oldest formation in Dickens County. After this formation rose above the sea, streams flowed over it, caused it to erode, and deposited the eroded material along the flood plains. This redeposited material is known as the Triassic red beds.

[9] Evaporation from a 4-foot, class A pan.

and precipitation data

Bureau Station at Spur]

Precipitation												
					1 year in 10 will have—		Average number of days with precipitation of [2]—			Snow and sleet		
Average total	Greatest daily	Year of occurrence	Driest year [1] (1956)	Wettest year [1] (1941)	Less than—	More than—	0.10 inch or more	0.50 inch or more	1.00 inch or more	Average monthly	Greatest monthly	Year of occurrence
In.	*In.*		*In.*	*In.*	*In.*	*In.*				*In.*	*In.*	
0. 63	1. 52	1939	0. 31	0. 88	0. 01	1. 34	2	([4])	0	1. 5	11. 1	1936
. 73	1. 28	1938	. 90	1. 64	([5])	1. 78	2	([4])	([4])	1. 2	9. 5	1956
. 74	1. 33	1951	([5])	2. 04	. 01	2. 04	2	([4])	0	. 2	3. 0	1951
1. 51	2. 50	1941	. 06	4. 17	. 29	3. 33	3	1	([4])	. 1	1. 1	1942
3. 00	3. 03	1941	2. 81	6. 94	. 46	5. 90	5	2	1	0	0	----------
2. 95	2. 54	1961 [6]	. 76	4. 12	. 23	5. 16	5	2	1	0	0	----------
2. 22	2. 98	1960	. 55	2. 94	. 07	3. 91	4	1	1	0	0	----------
1. 89	3. 06	1946	. 04	1. 46	. 11	4. 04	3	1	1	0	0	----------
2. 73	3. 37	1941	([5])	9. 90	. 07	6. 23	3	2	1	0	0	----------
2. 26	4. 28	1960	1. 11	7. 90	. 31	4. 21	4	2	2	([5])	([5])	1949
. 96	2. 10	1963	. 04	. 21	. 02	2. 62	2	1	([4])	. 2	0	----------
. 81	1. 70	1947	. 41	. 67	. 01	2. 03	2	1	([4])	1. 4	0	----------
20. 43	4. 28	1960	6. 99	42. 87	12. 88	26. 28	37	13	7	4. 6	11. 1	1936

[4] Less than one-half day.
[5] Trace.
[6] Also in earlier months or years.

During the Cretaceous period a shallow arm of the sea partly covered the Triassic red beds and dropped sand, silt, clay, and limestone over much of them. The Cretaceous sediments are now thin and discontinuous in Dickens County.

Formation of the Rocky Mountains brought about accelerated erosion. Swift streams cut large valleys and canyons through the Cretaceous and Triassic sediments and into the Permian sediments. They washed away most of the Cretaceous sediments and all of the Triassic sediments from the eastern part of the county. Where the streams began to slow at the foot of steep slopes, large amounts of gravel, sand, and silt were deposited. These materials gave rise to the Ogallala Formation, which is exposed mostly in the northwestern part of the county, below the High Plains [10].

Glaciers did not extend as far south as Dickens County, but they did cause the climate to be cooler and more humid. As a result, precipitation increased and more rivers and valleys were formed. Tributaries of the Brazos River and the Red River have cut through the Ogallala and Triassic deposits in Dickens County and, in some places, have cut deeply into the Permian deposits.

The parent material of the soils in Dickens County was derived from the Ogallala Formation, the Triassic red beds, the Permian red beds, and outwash materials. Most of the soils best suited to cultivation formed in old alluvial outwash. Water-bearing sands of the Ogallala Formation supply irrigation water for the High Plains, and fairly thin strata of outwash sand and gravel supply water for the Rolling Plains.

[10] JOHN C. FRYE and A. BYRON LEONARD, STUDIES OF CENOZOIC GEOLOGY ALONG EASTERN MARGIN OF TEXAS HIGH PLAINS, ARMSTRONG TO HOWARD COUNTIES. Bur. Econ. Geol. Report No. 32, 62 pp., illus. 1957.

Agriculture

Dryland farming, irrigation farming, and cattle ranching are of major importance in Dickens County. About 69 percent of the county is used as range. Cotton, sorghum, and wheat are the major cultivated crops. Table 8 lists acreages of the major crops grown in the county in 1959 and 1965. Table 9 lists the numbers of animals on farms. The data in these tables were obtained from local records of the Agricultural Stabilization and Conservation Service and from estimates provided by the Texas Agricultural Experiment Station and the Chamber of Commerce.

Cotton is the major cash crop. Grain sorghum and forage sorghum are important crops, especially on diversified farms, and are fed to cattle. Wheat is grown for grain on most farms, but much of the acreage also is used for pasture. A few areas are used for barley and oats.

Irrigation farming started in the 1930's and has increased rapidly since 1950. Wells furnish most of the water for irrigation. They furnish water for about 12,000 acres of cropland and pasture, although most yield less than 200 gallons per minute. Water on the High Plains comes from wells that are mostly 200 to 300 feet deep. These wells have little or no recharge, however, and the

TABLE 8.—*Acreage of principal crops in 1959 and 1965*

Crop	1959	1965
Cotton	44, 176	52, 635
Sorghum for all purposes	33, 076	36, 368
Harvested for grain	26, 909	23, 581
Cut for silage or hay, hogged, or grazed	6, 167	12, 787
Corn for all purposes	197	400
Wheat	10, 493	20, 117
Oats	992	1, 600
Barley	(1)	750

1 Not reported.

TABLE 9.—*Number of livestock on farms in 1959 and 1965*

Livestock	1959	1965
Cattle and calves	18, 864	22, 765
Hogs and pigs	3, 755	3, 870
Sheep and lambs	1, 126	1, 275
Horses and colts	525	498
Chickens 1	18, 058	36, 100

1 Four months old and over.

water level gets lower each year. Water for irrigation on the Rolling Plains comes mostly from wells less than 100 feet deep. This supply of ground water is recharged with water from the major creeks and drainageways and has only seasonal fluctuations.

Raising beef cattle is a major enterprise. On large ranches the cattle feed mainly on native range, but on most farm-ranch units supplemental feed grains and forage crops are grown. Practically all ranches and farms have cowherds and sell feeder or replacement calves at weaning time. If surplus feed is available, a few ranchers carry over some calves for marketing later or for sale as stocker cattle.

Large chickenhouses have brought about a rapid increase in the production of broilers. A few farmers have tried intensified production of swine. Some dairy cattle and sheep also are raised.

Facilities and Enterprises

All rural areas have electricity, and most have telephones. The farm-labor force generally is sufficient because mechanized cotton strippers and pickers, tractors, and other kinds of equipment have eliminated much of the handwork.

U.S. Highway No. 82, which runs east and west, and State Highway No. 70, which runs north and south, intersect near the center of Dickens County. A weekly freight line enters the county from the south and terminates at Spur. Paved roads pass within 3 miles of most farms, and unpaved roads are usable except for short periods.

This county has six cotton gins that generally process more than 22,000 bales of cotton each year. It has two grain elevators, several small businesses that handle agricultural products for marketing, and a few producing oil wells.

Glossary

Alluvium. Soil material, such as sand, silt, and clay, that has been deposited on land by streams.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soils between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperate areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Clay. As a soil separate, mineral soil particles that are less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt. (See also Texture, soil.)

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors that consist of concentrations of compounds or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate ($CaCO_3$) and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; soil will not hold together in a mass.

Friable.—When moist, soil crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, soil adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, soil is moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, soil breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; soil is little affected by moistening.

Erosion. The wearing away of the land surface by wind, running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless artificially protected.

Hardpan. A hardened or cemented soil layer.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

O horizon. The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residue.

A horizon. The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon. The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. The combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon. The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the underlying material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer. Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Phase, soil. A subdivision of a soil type, series, or other unit in the soil classification system, made because of differences that affect the management of soils but not their classification. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects management.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degree of acidity or alkalinity is expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid.	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
		Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline.	9.1 and higher
Slightly acid	6.1 to 6.5		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. As a soil separate, individual rock or mineral fragments 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soils includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. Living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes my be further divided by specifying "coarse," "fine," or "very fine."

Type, soil. A subdivision of the soil series, made on the basis of differences in the texture of the surface layer.

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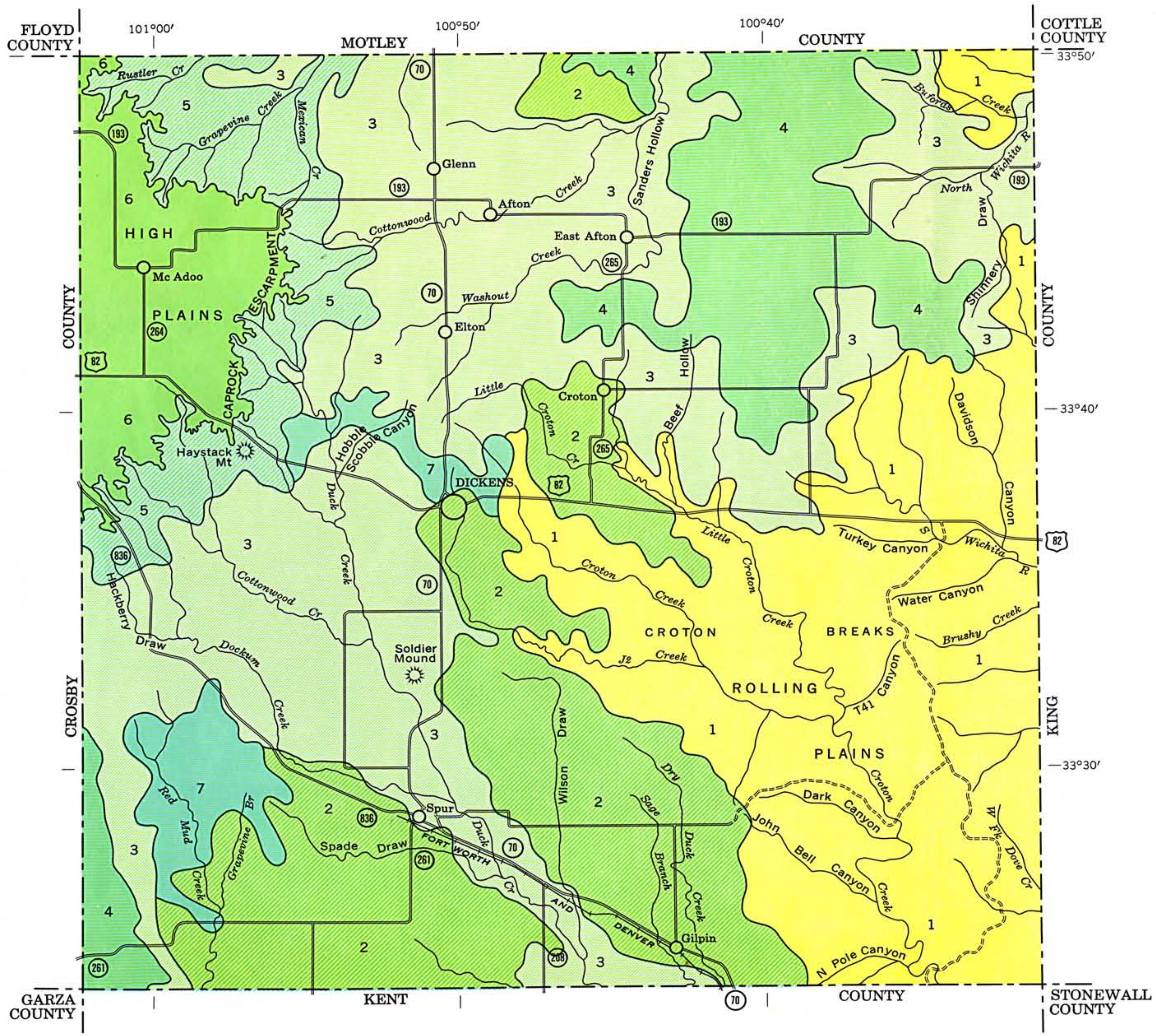


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

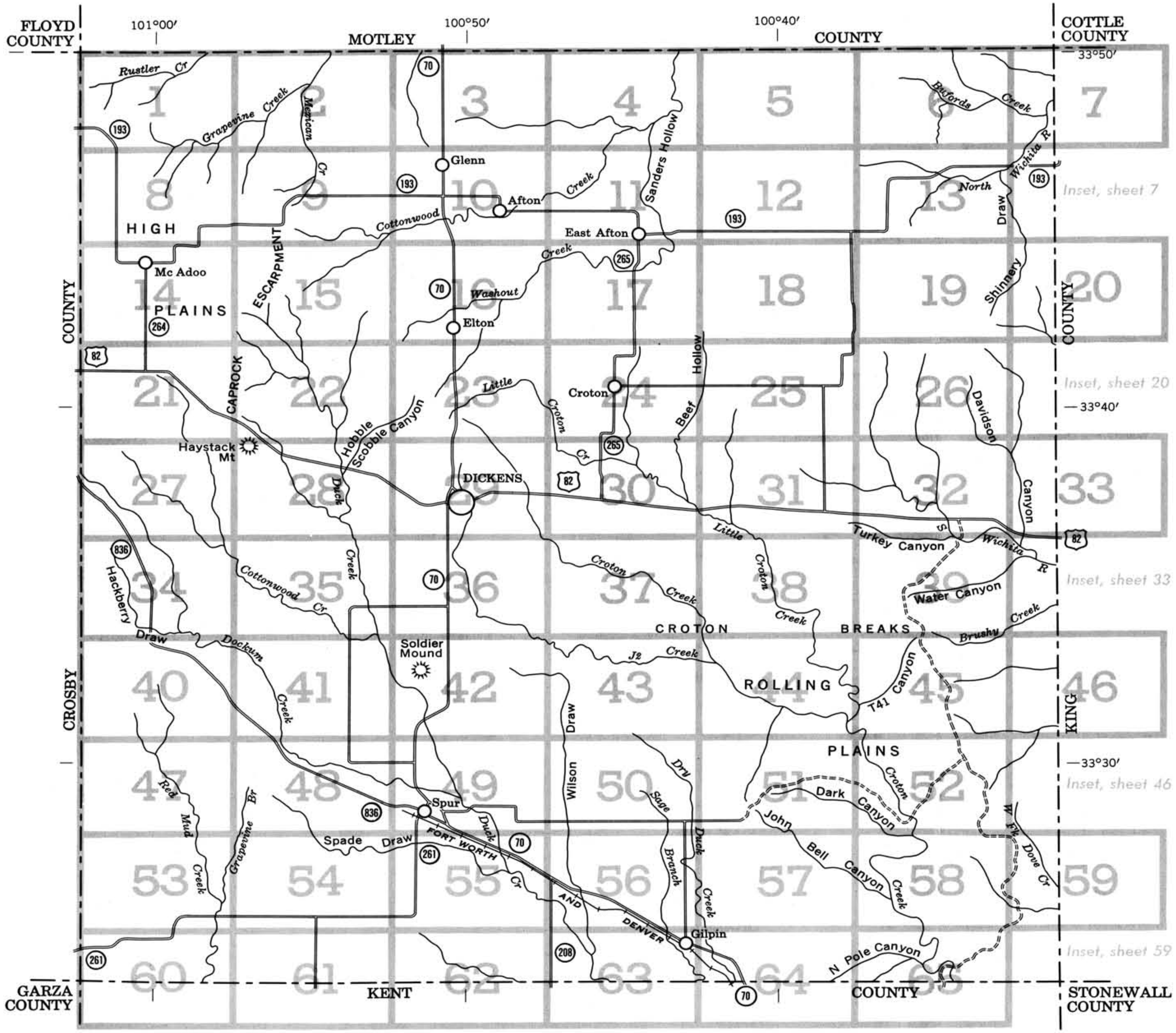
DICKENS COUNTY, TEXAS

SCALE IN MILES
1 0 1 2 3 4

SOIL ASSOCIATIONS

1. Woodward–Quinlan–Cottonwood association: Moderately deep to very shallow, loamy soils of the breaks
2. Olton–Weymouth–Abilene association: Nearly level to moderately sloping, chiefly deep, loamy soils
3. Miles association: Nearly level to sloping, deep, loamy and sandy soils
4. Brownfield–Nobscot association: Undulating, deep, sandy soils
5. Rough broken land–Berda–Mansker association: Rough lands and moderately sloping to steep soils below the caprock
6. Pullman association: Nearly level to gently sloping, deep, loamy soils
7. Vernon–Olton–Miles association: Gently sloping to sloping, shallow to deep, loamy and clayey soils

November 1968



INDEX TO MAP SHEETS
DICKENS COUNTY, TEXAS

SCALE IN MILES

1 0 1 2 3 4

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are for nearly level soils or land types, but some are for soils or land types that have a considerable range in slope. The final number, 2, in the symbol means that the soil is eroded. (W) following the soil name indicates that signs of erosion, especially of local shifting of soil by wind, are evident in places, but the degree of erosion cannot be estimated reliably.

SYMBOL	NAME
AbA	Abilene clay loam, 0 to 1 percent slopes
BmD	Berda–Mansker complex, 3 to 8 percent slopes
BpF	Berda–Potter association, 3 to 30 percent slopes 1/ (W)
BuB	Bippus clay loam, 1 to 3 percent slopes
Bv	Breaks–Alluvial land complex
Bw	Brownfield–Nobscot association, undulating 1/ (W)
CaB	Carey loam, 1 to 3 percent slopes
CaC	Carey loam, 3 to 5 percent slopes
Cd	Colorado soils
CoB	Cottonwood soils, 1 to 3 percent slopes
EnB	Enterprise very fine sandy loam, 1 to 3 percent slopes
EnC	Enterprise very fine sandy loam, 3 to 5 percent slopes
LaD	Larom gravelly soils, 3 to 8 percent slopes
Lc	Lincoln loamy fine sand, loamy substratum variant (W)
Ln	Lincoln soils (W)
Lo	Lofton clay loam
Ma	Mangum soils
McB	Mansker loam, 1 to 3 percent slopes
McC	Mansker loam, 3 to 5 percent slopes
Md	Meno fine sandy loam
Me	Meno loamy fine sand (W)
MfA	Miles fine sandy loam, 0 to 1 percent slopes
MfB	Miles fine sandy loam, 1 to 3 percent slopes
MfC	Miles fine sandy loam, 3 to 5 percent slopes
MfD	Miles fine sandy loam, 5 to 8 percent slopes (W)
MlB	Miles loamy fine sand, 0 to 3 percent slopes (W)
MlC	Miles loamy fine sand, 3 to 5 percent slopes (W)
MsC2	Miles soils, 2 to 6 percent slopes, eroded
MtB	Mobeetie fine sandy loam, 1 to 3 percent slopes
MtC	Mobeetie fine sandy loam, 3 to 5 percent slopes
OcA	Olton clay loam, 0 to 1 percent slopes
OcB	Olton clay loam, 1 to 3 percent slopes
PoA	Portales loam, 0 to 1 percent slopes
PuA	Pullman clay loam, 0 to 1 percent slopes
PuB	Pullman clay loam, 1 to 3 percent slopes
Qc	Quinlan–Cottonwood complex
Ra	Randall clay
Rf	Randall fine sandy loam
Ro	Rock outcrop
Ru	Rough broken land
Sp	Spur clay loam
Sr	Spur fine sandy loam
StB	Stamford clay, 1 to 3 percent slopes
TlA	Tillman clay loam, 0 to 1 percent slopes
TlB	Tillman clay loam, 1 to 3 percent slopes
VeB	Veal fine sandy loam, 1 to 3 percent slopes (W)
VeC	Veal fine sandy loam, 3 to 5 percent slopes (W)
VnD	Vernon soils, 3 to 8 percent slopes
Vr	Vernon–Badland complex, hilly
WeB	Weymouth clay loam, 1 to 3 percent slopes
WeC	Weymouth clay loam, 3 to 5 percent slopes
WoB	Woodward loam, 1 to 3 percent slopes
WoC	Woodward loam, 3 to 5 percent slopes
WuE	Woodward–Quinlan loams, 3 to 15 percent slopes
Ya	Yahola very fine sandy loam

1/ The composition of these units is more variable than that of the others of the County but has been controlled well enough to interpret for the expected use of the soil.

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

School

Church

Windmill

Mines and Quarries

Mine dump

Pits, gravel or other

Power line

Pipeline

Cemetery

Dams

Levee

Fence

Fence along county line

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water) (w)
- Intermittent

Wells, water, irrigation

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

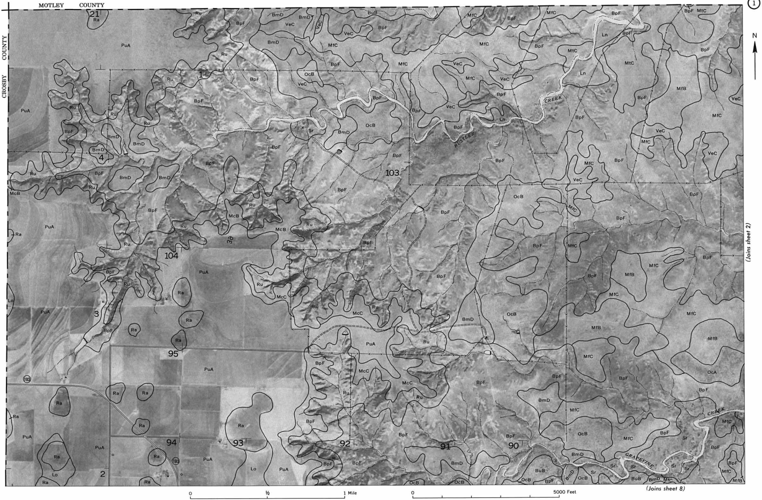
Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stony, very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

Soil map constructed 1967 by Cartographic Division, Soil Conservation Service, USDA, from 1963 aerial photographs. Controlled mosaic based on Texas plane coordinate system, north central zone, Lambert conformal conic projection, 1927 North American datum.

(1)



This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 1

DICKENS COUNTY, TEXAS NO. 2

Land division corners are approximately positioned on this map.

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0 ½ 1 Mile

0 5000 Feet

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Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 3

4

N

(Joins sheet 3)

(Joins sheet 5)

(Joins sheet 11)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 4

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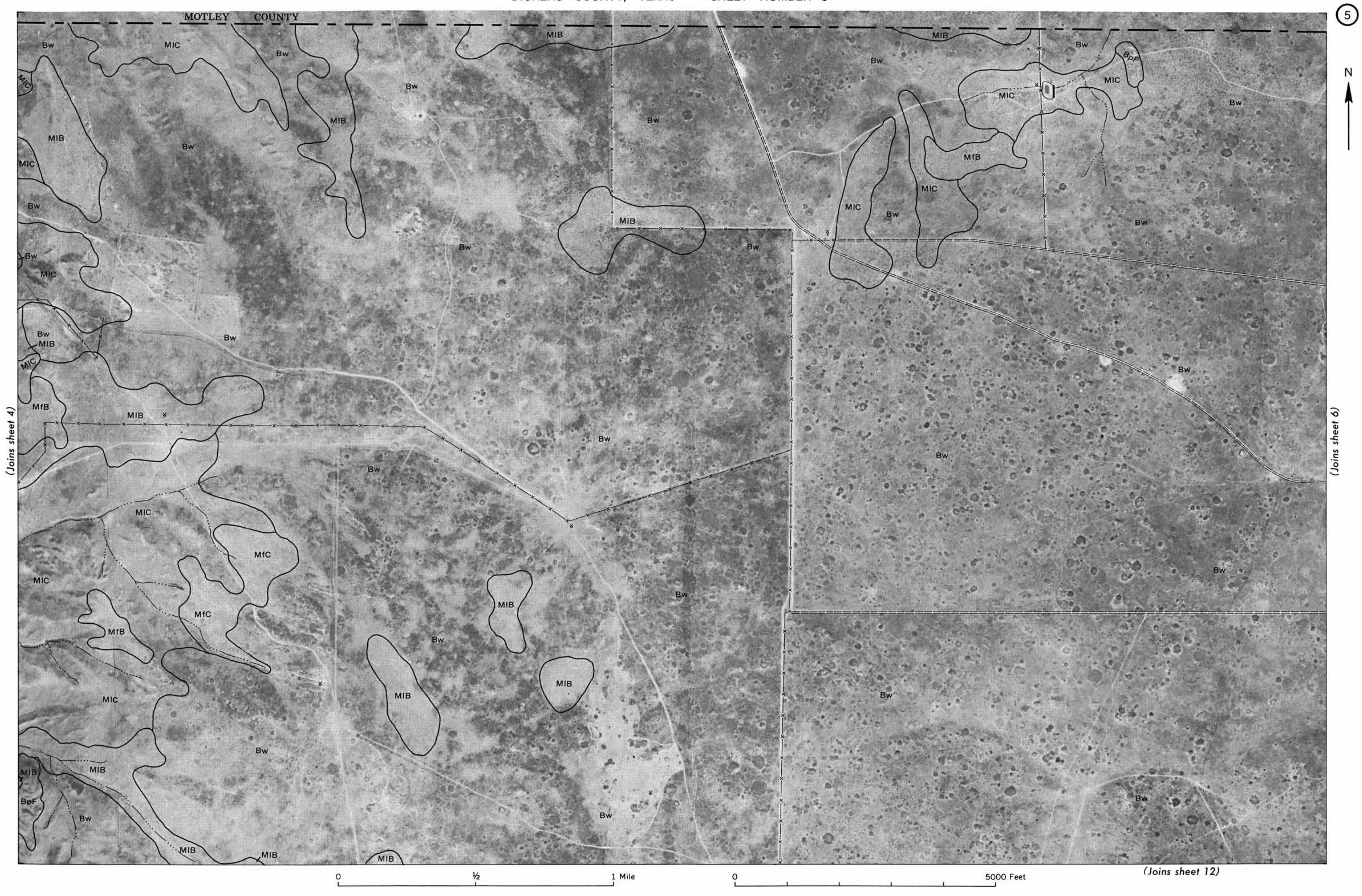
DICKENS COUNTY, TEXAS — SHEET NUMBER 5



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DICKENS COUNTY, TEXAS NO. 5

DICKENS COUNTY, TEXAS — SHEET NUMBER 6

6

N

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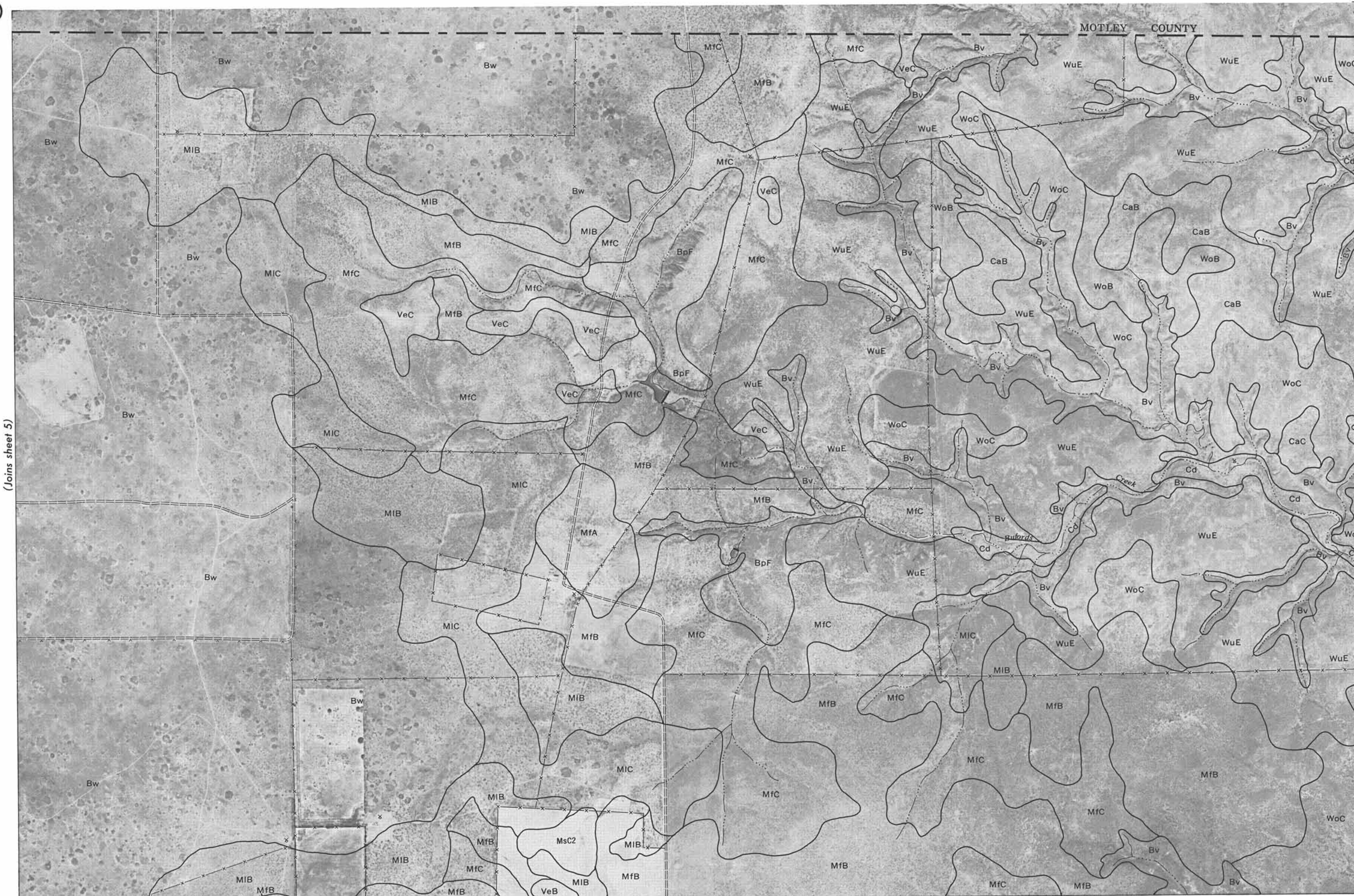

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(Joins sheet 13)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 6

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DICKENS COUNTY, TEXAS — SHEET NUMBER 7

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Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO 7

(Joins sheet 6)

(Joins upper right)

0 ½ 1 Mile

(Joins lower left)

(Joins sheet 13)

(Joins sheet 20)

0 5000 Feet

DICKENS COUNTY, TEXAS — SHEET NUMBER 8

(8)

(Joins sheet 1)

(Joins sheet 14)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 8

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DICKENS COUNTY, TEXAS — SHEET NUMBER 9

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 9

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Land division corners are approximately positioned on this map.

10

N

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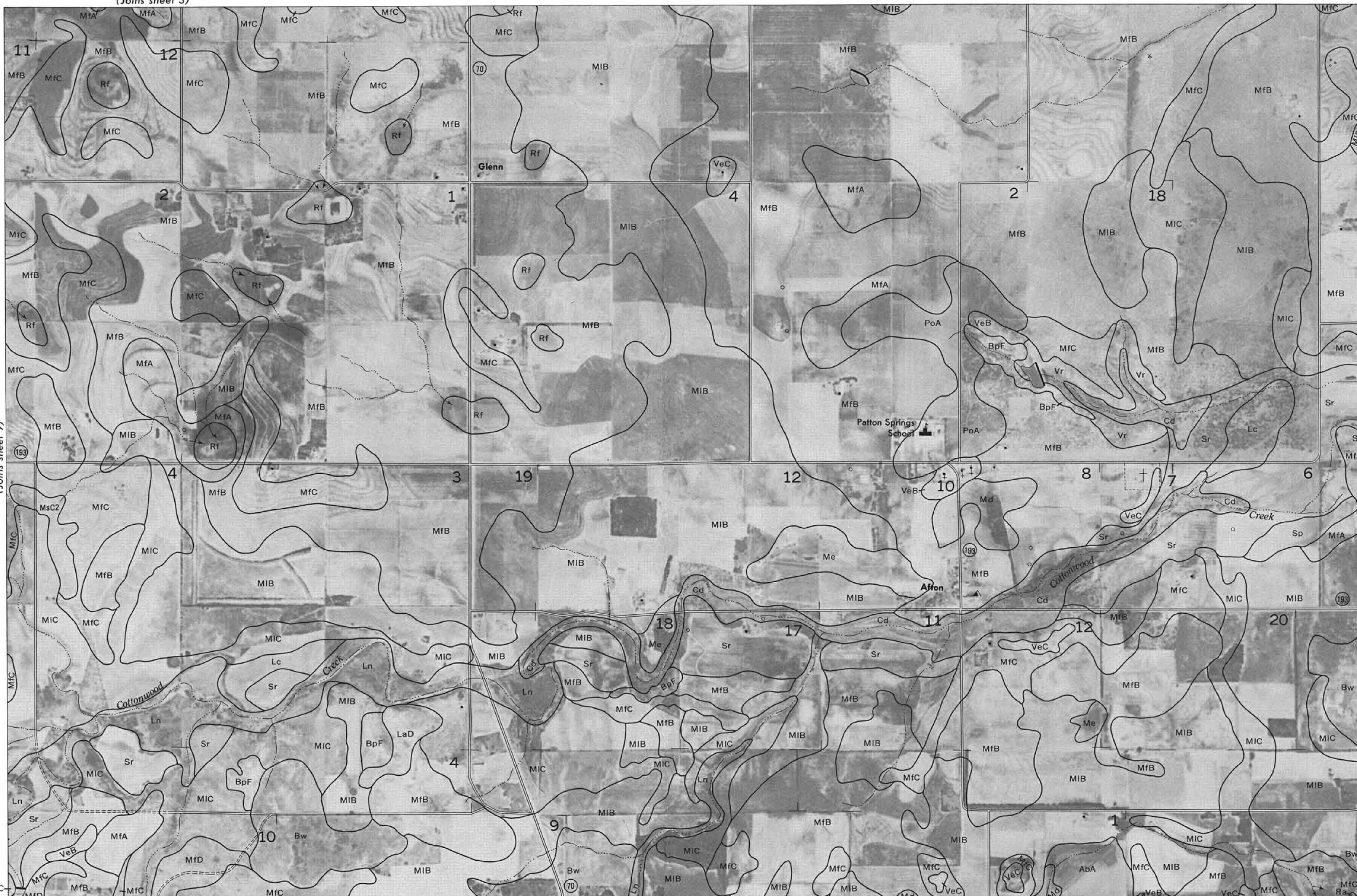
(Joins sheet 9)



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(Joins sheet 16)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 10

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DICKENS COUNTY, TEXAS NO. 11

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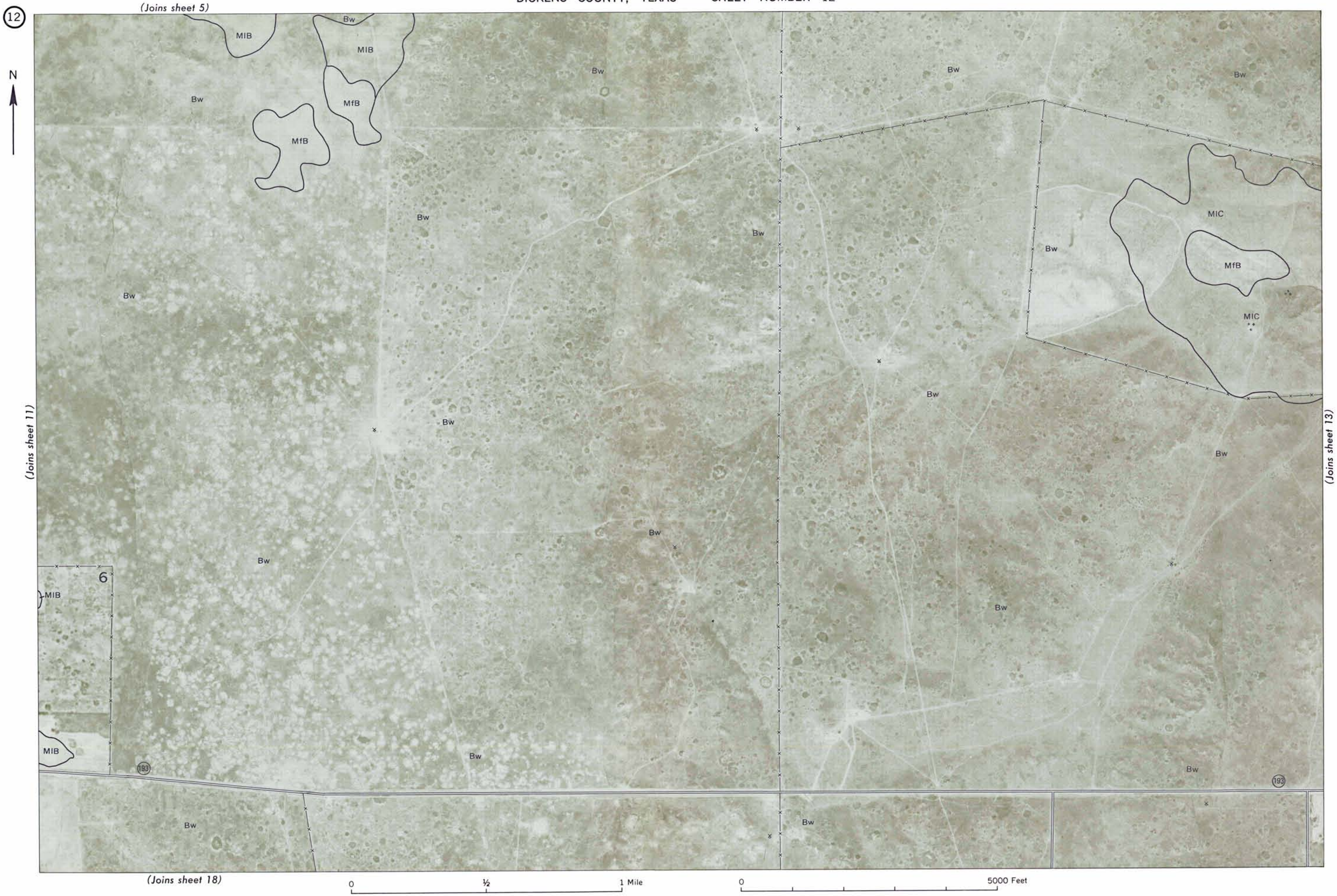

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Land division corners are approximately positioned on this map.

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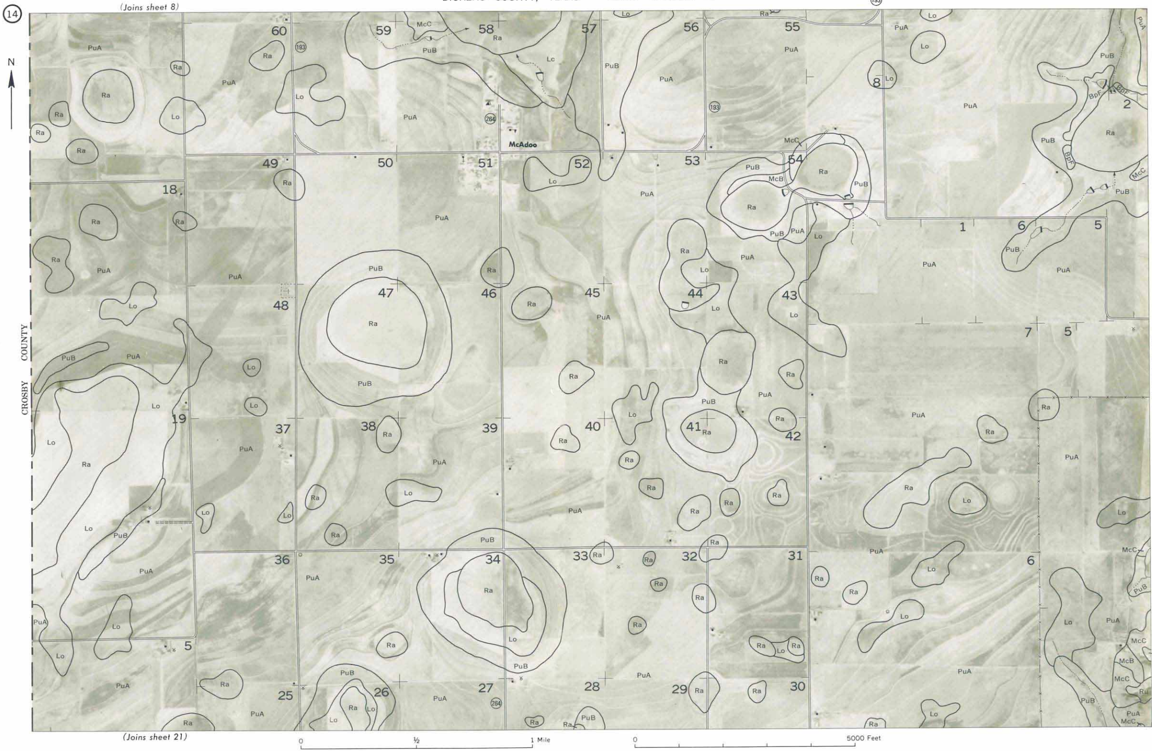
Land division corners are approximately positioned on this map.



Land division corners are approximately positioned on this map.

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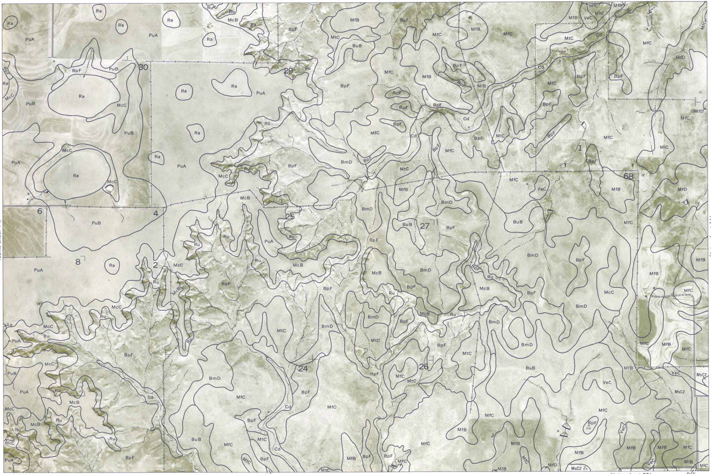

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(Joins sheet 22)

0 ½ 1 Mile

0 5000 Feet

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DICKENS COUNTY, TEXAS NO. 15

16

N

(Joins sheet 10)

(Joins sheet 15)

(Joins sheet 17)

(Joins sheet 23)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 16

Land division corners are approximately positioned on this map.

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17

(Joins sheet 11)

(Joins sheet 16)

(Joins sheet 18)

(Joins sheet 24)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

18

DICKENS COUNTY, TEXAS — SHEET NUMBER 18

DICKENS COUNTY, TEXAS NO. 18

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 13)

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 26)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 19

DICKENS COUNTY, TEXAS — SHEET NUMBER 20

0 ½ 1 Mile

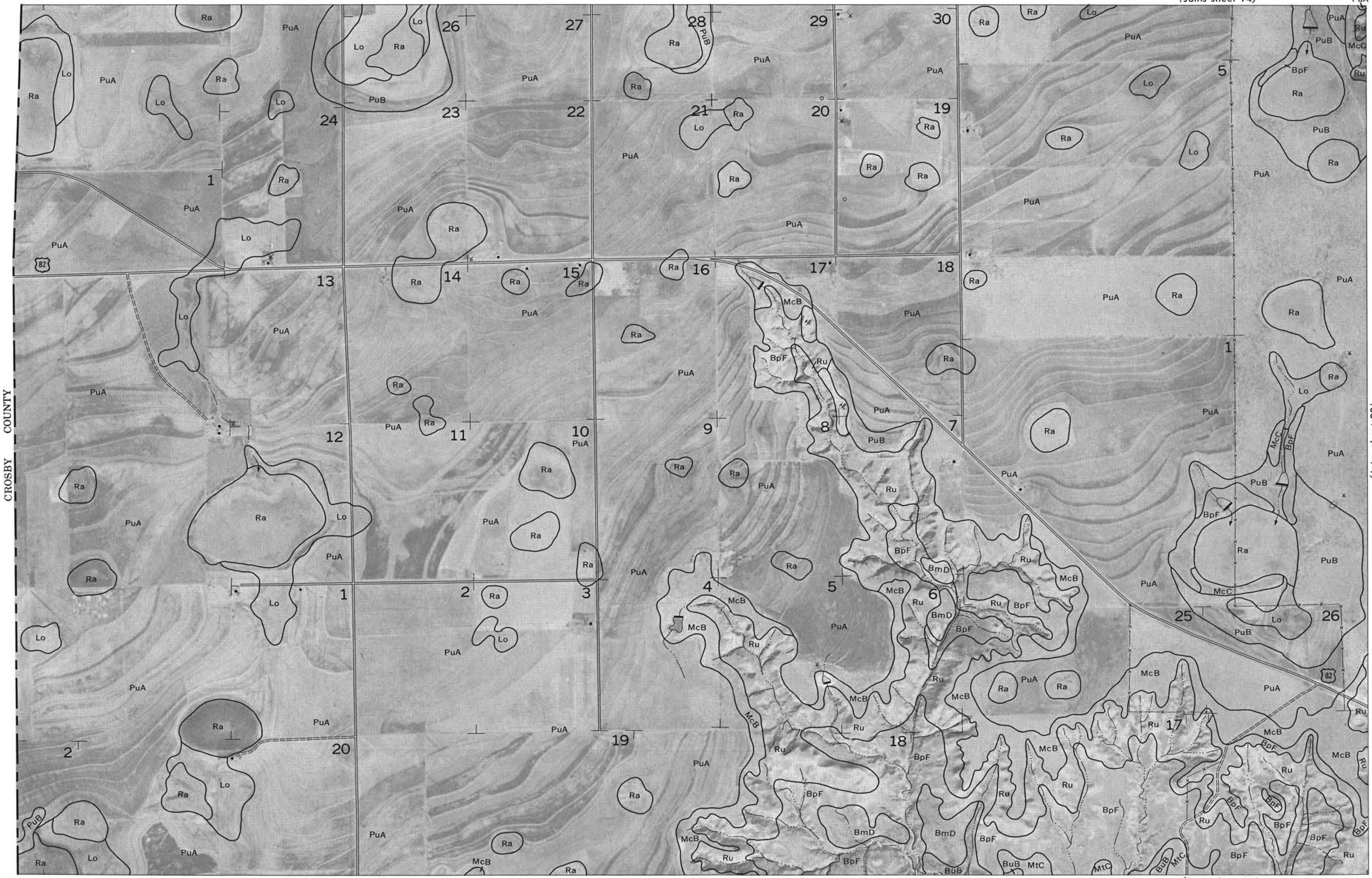
0 5000 Feet

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

DICKENS COUNTY, TEXAS — SHEET NUMBER 21

21



0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 21

DICKENS COUNTY, TEXAS — SHEET NUMBER 22

22

N

(Joins sheet 15)

(Joins sheet 23)

(Joins sheet 28)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 22

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 16)

(Joins sheet 22)

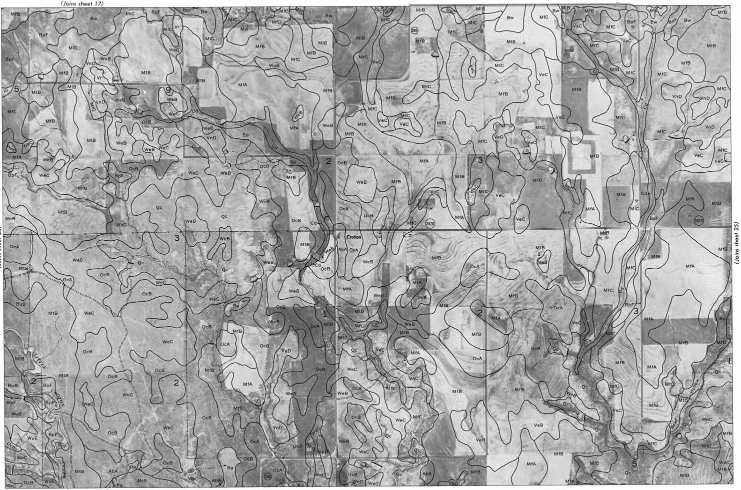
(Joins sheet 24)

(Joins sheet 29)

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 23

DICKENS COUNTY, TEXAS — SHEET NUMBER 24



0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 24

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 18)

25

N

(Joins sheet 24)

(Joins sheet 26)

(Joins sheet 31)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 26

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 21)

27

(Joins sheet 28)

(Joins sheet 34) | (35)

DICKENS COUNTY, TEXAS NO. 27

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS — SHEET NUMBER 28

(Joins sheet 22)

(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 35)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 28

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 23)

(Joins sheet 28)

(Joins sheet 30)

(Joins sheet 36)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

(30)

DICKENS COUNTY, TEXAS — SHEET NUMBER 30

(Joins sheet 24)

(Joins sheet 29)

(Joins sheet 31)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 30

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 25)

31

(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 38)

0 ½ 1 Mile

0 5000 Feet

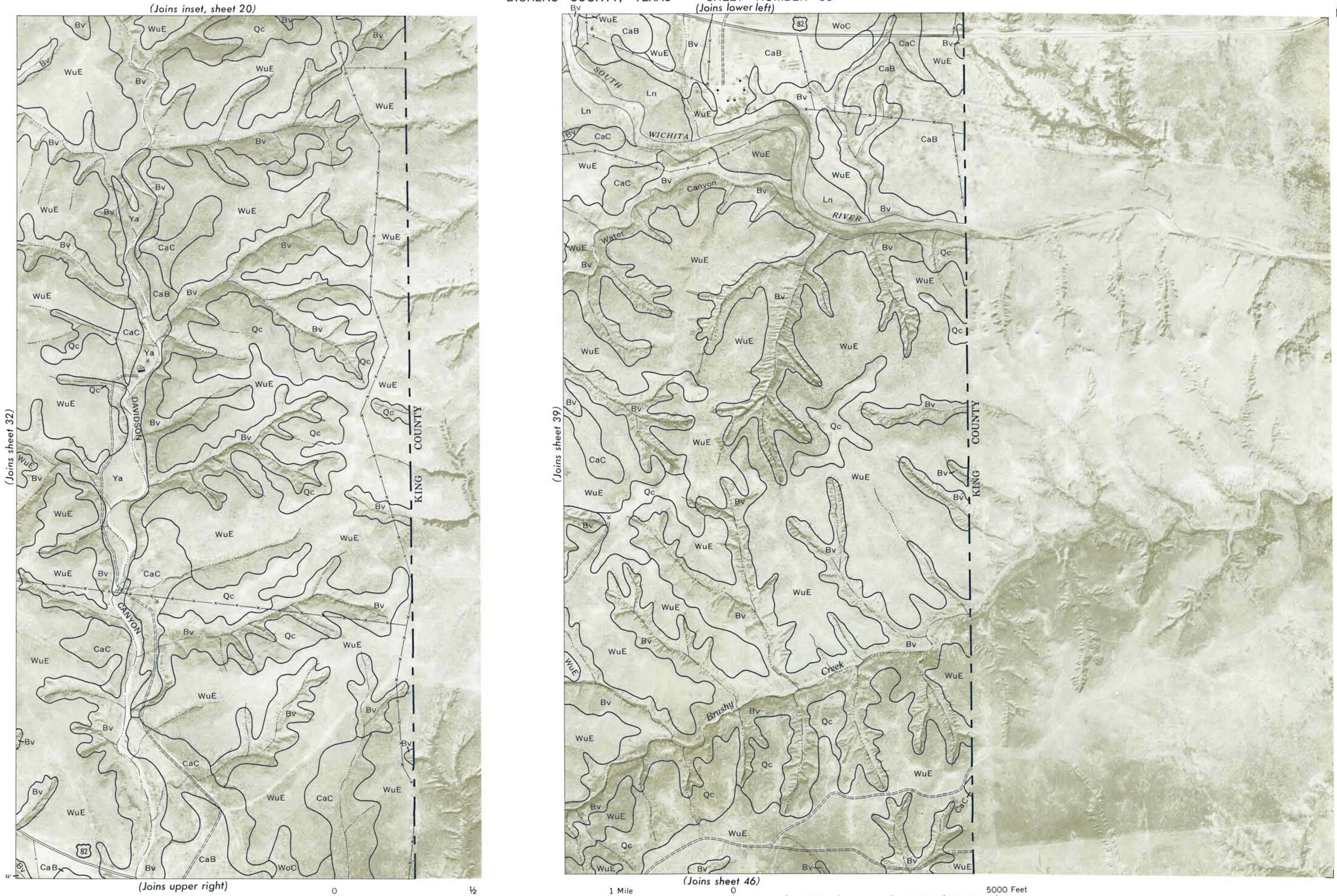
DICKENS COUNTY, TEXAS NO. 31

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

32

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.



This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 33

(34)

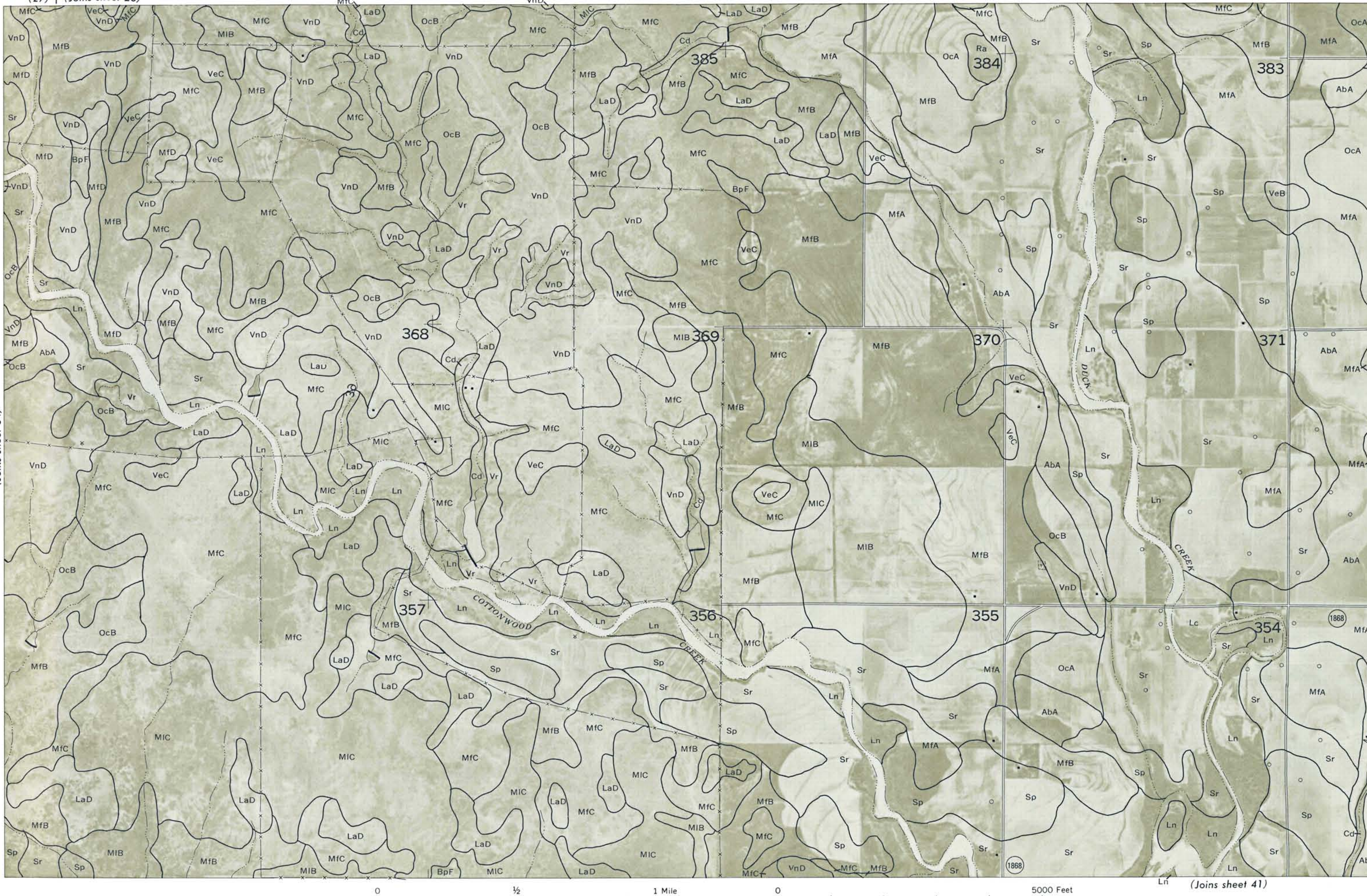
0 ½ 1 Mile

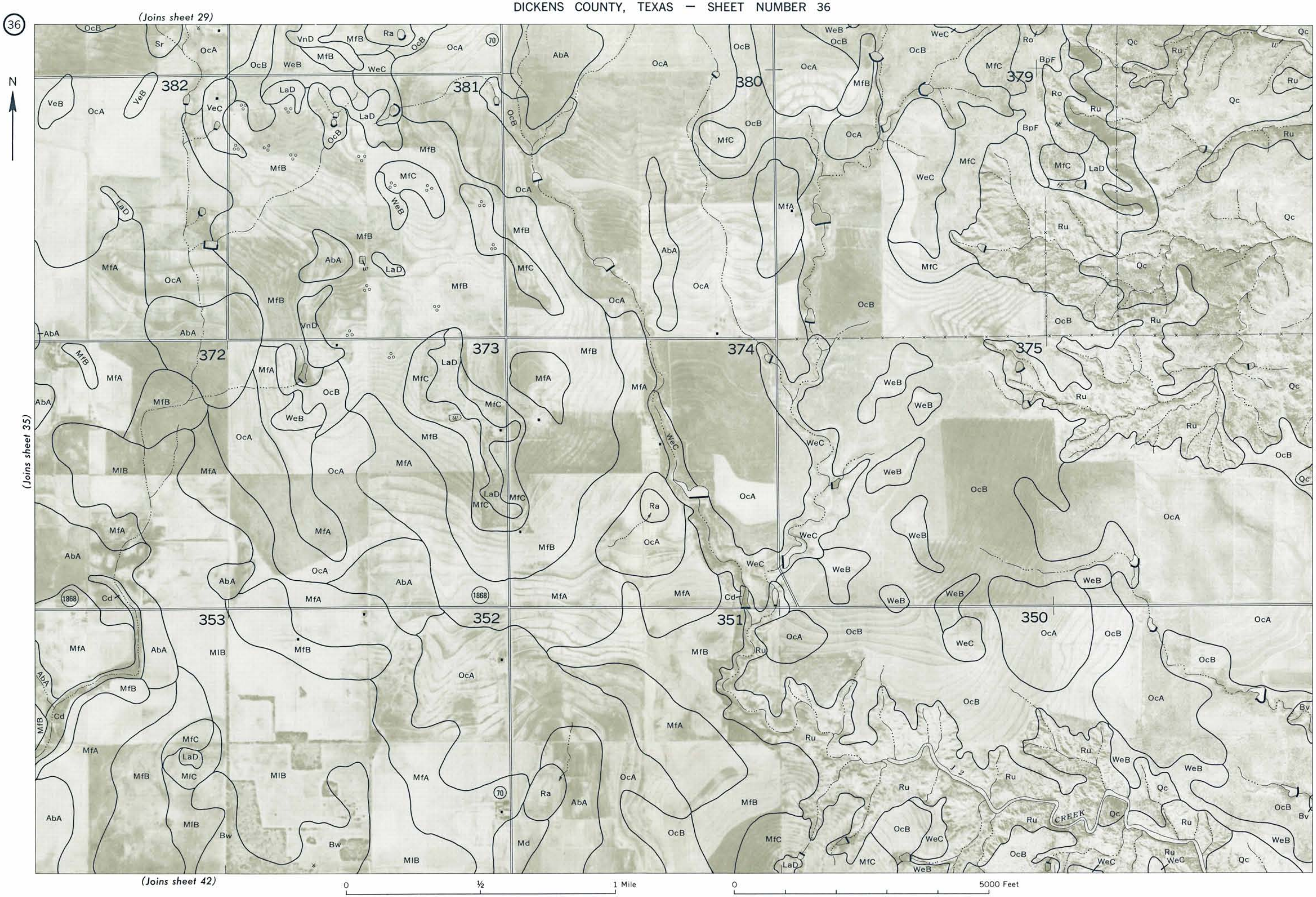
0 5000 Feet

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(27) | (Joins sheet 28)





DICKENS COUNTY, TEXAS NO. 36

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 37

N

(Joins sheet 31)

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 44)

0 ½ 1 Mile

0 5000 Feet

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 32)

(Joins sheet 38)

(Joins inset, sheet 33)

(Joins sheet 45)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS — SHEET NUMBER 40

(Joins sheet 34)

(Joins sheet 47)

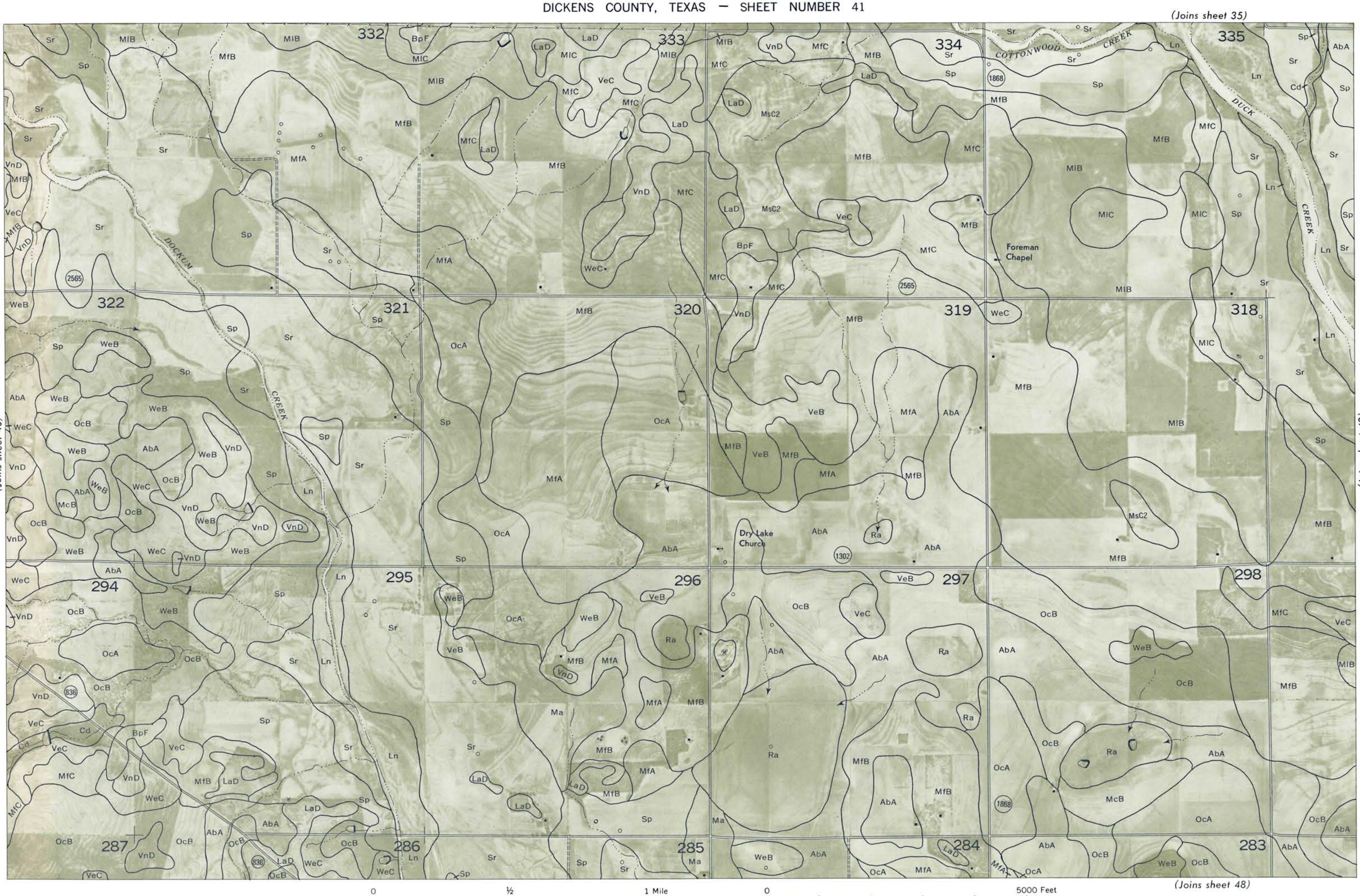
0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 40

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.


(Joins sheet 35)
(Joins sheet 40)
(Joins sheet 42)
(Joins sheet 48)
N
DOCKUM CREEK
COTTONWOOD CREEK
DUCK CREEK
Foreman Chapel
Dry Lake Church
332
333
334
335
322
321
320
319
318
294
295
296
297
298
287
286
285
284
283
2565
1868
1302
836
MfB
MfC
MfA
MlB
MlC
MsC2
McB
Sr
Sp
VnD
VeC
VeB
WeB
WeC
LaD
BpF
OcA
OcB
AbA
Ln
Cd
Ra
Ma
0
½
1 Mile
0
5000 Feet

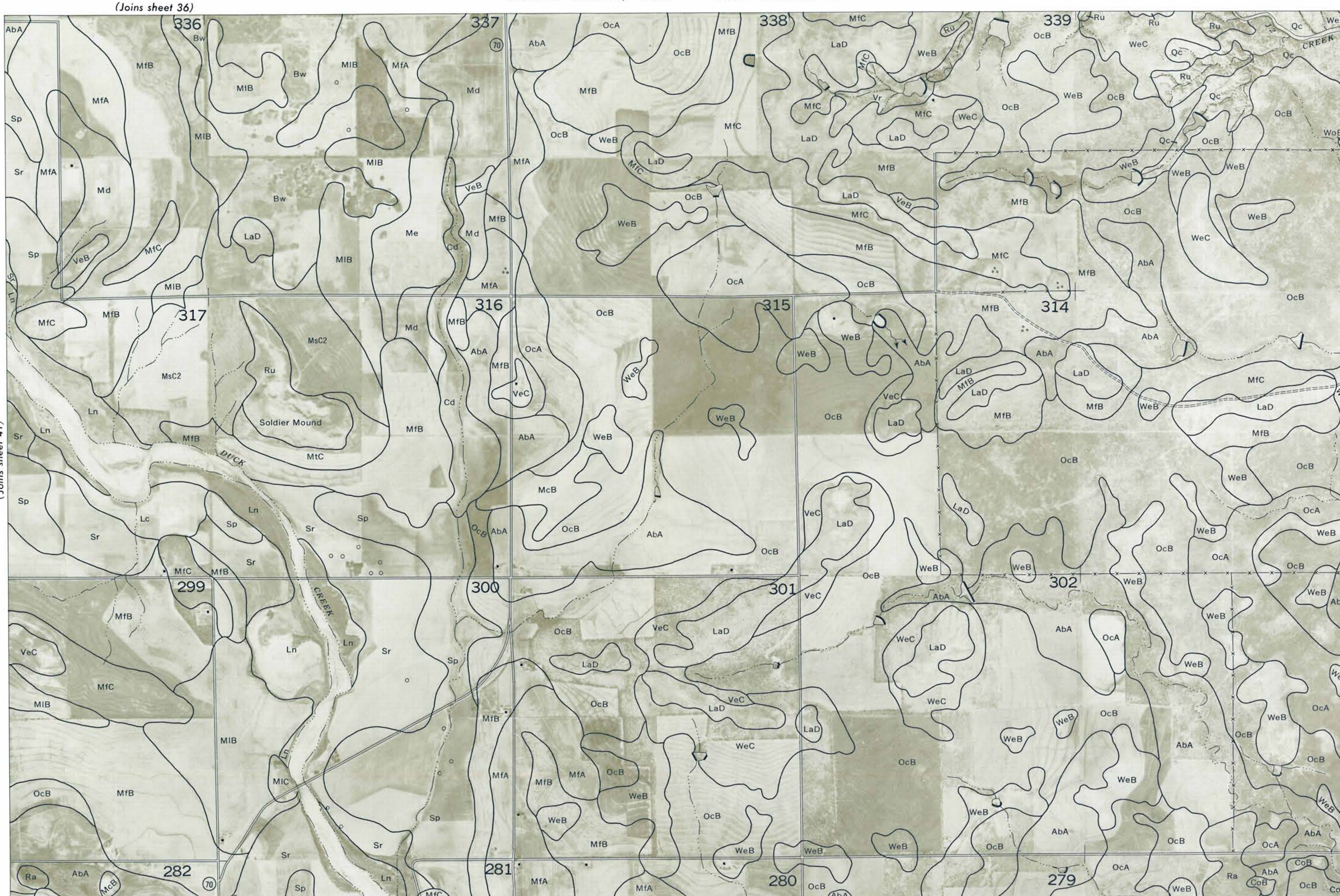
DICKENS COUNTY, TEXAS — SHEET NUMBER 42

42

(Joins sheet 36)

N

(Joins sheet 41)



(Joins sheet 43)

(Joins sheet 49)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 42

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS — SHEET NUMBER 44

Land division corners are approximately positioned on this map.

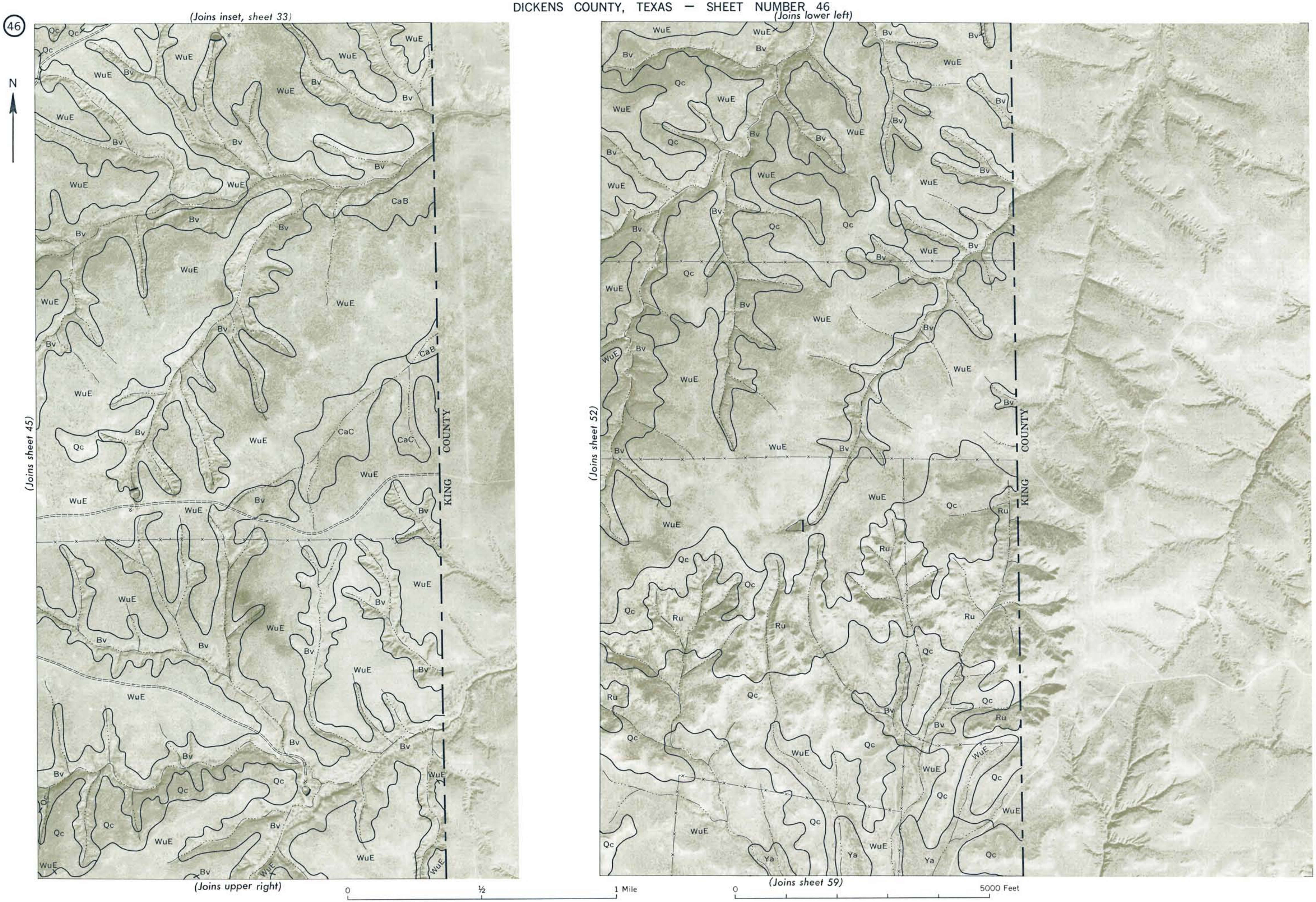
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

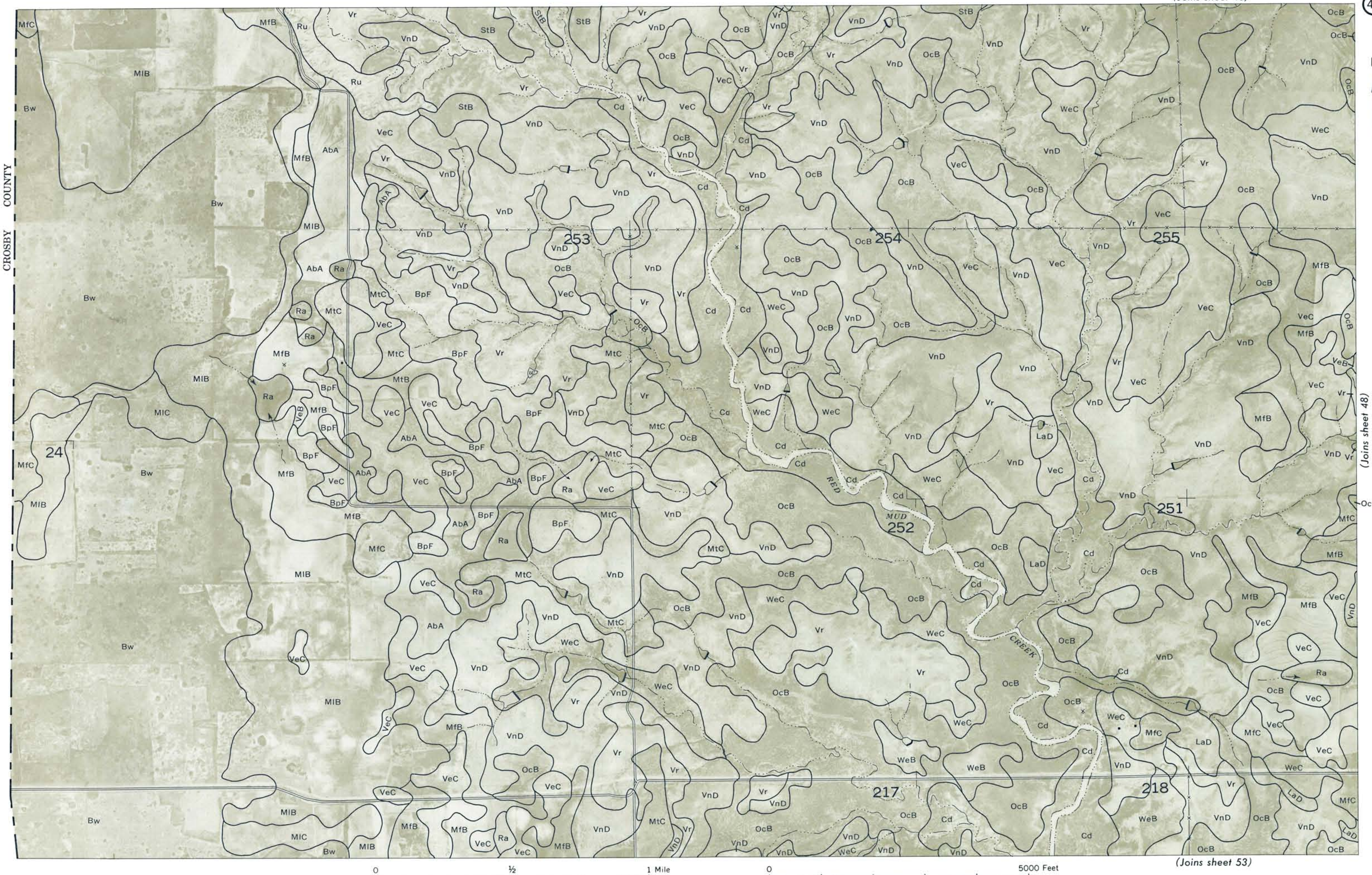
46



DICKENS COUNTY, TEXAS NO. 46

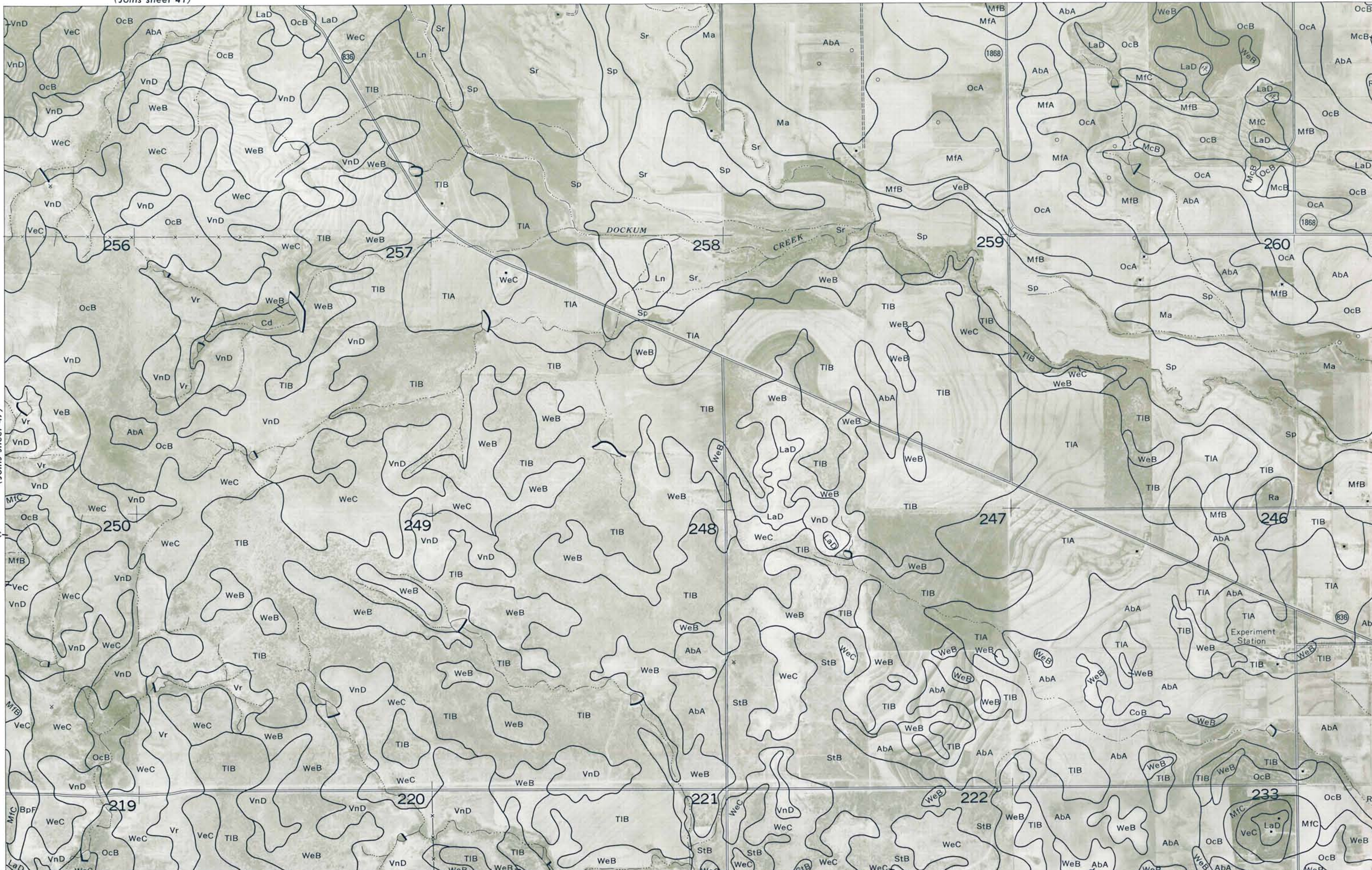
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.


(Joins sheet 40)
47
N
CROSBY COUNTY
DICKENS COUNTY, TEXAS NO. 47
(Joins sheet 48)
(Joins sheet 53)
RED MUD CREEK
253
254
255
24
251
252
217
218
0
½
1 Mile
0
5000 Feet

48

(Joins sheet 41)



(Joins sheet 54)

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 42)

(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 55)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS — SHEET NUMBER 50

(Joins sheet 43)

(Joins sheet 49)

(Joins sheet 51)

(Joins sheet 56)

0 ½ 1 Mile

0 5000 Feet

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

52

N

(Joins sheet 45)

(Joins sheet 51)

(Joins inset, sheet 46)

(Joins sheet 58)

0 ½ 1 Mile

0 5000 Feet

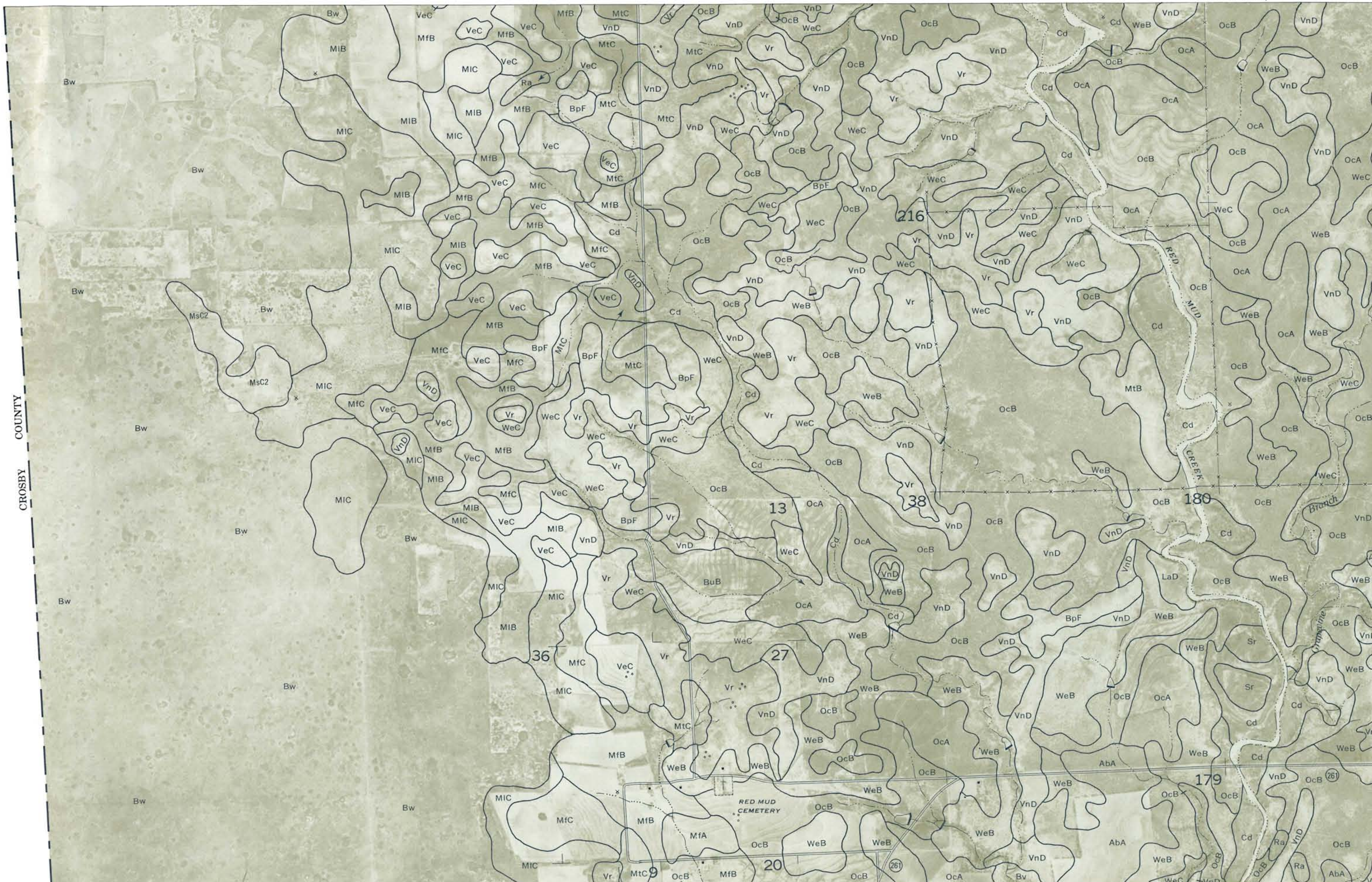
DICKENS COUNTY, TEXAS NO. 52

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

53

(Joins sheet 47)



(Joins sheet 54)

(Joins sheet 60)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 53

54

DICKENS COUNTY, TEXAS — SHEET NUMBER 54

(Joins sheet 48)

(Joins sheet 53)

(Joins sheet 55)

(Joins sheet 61)

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 55

DICKENS COUNTY, TEXAS — SHEET NUMBER 56

56

(Joins sheet 50)

N

(Joins sheet 55)

(Joins sheet 57)

(Joins sheet 63)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 56

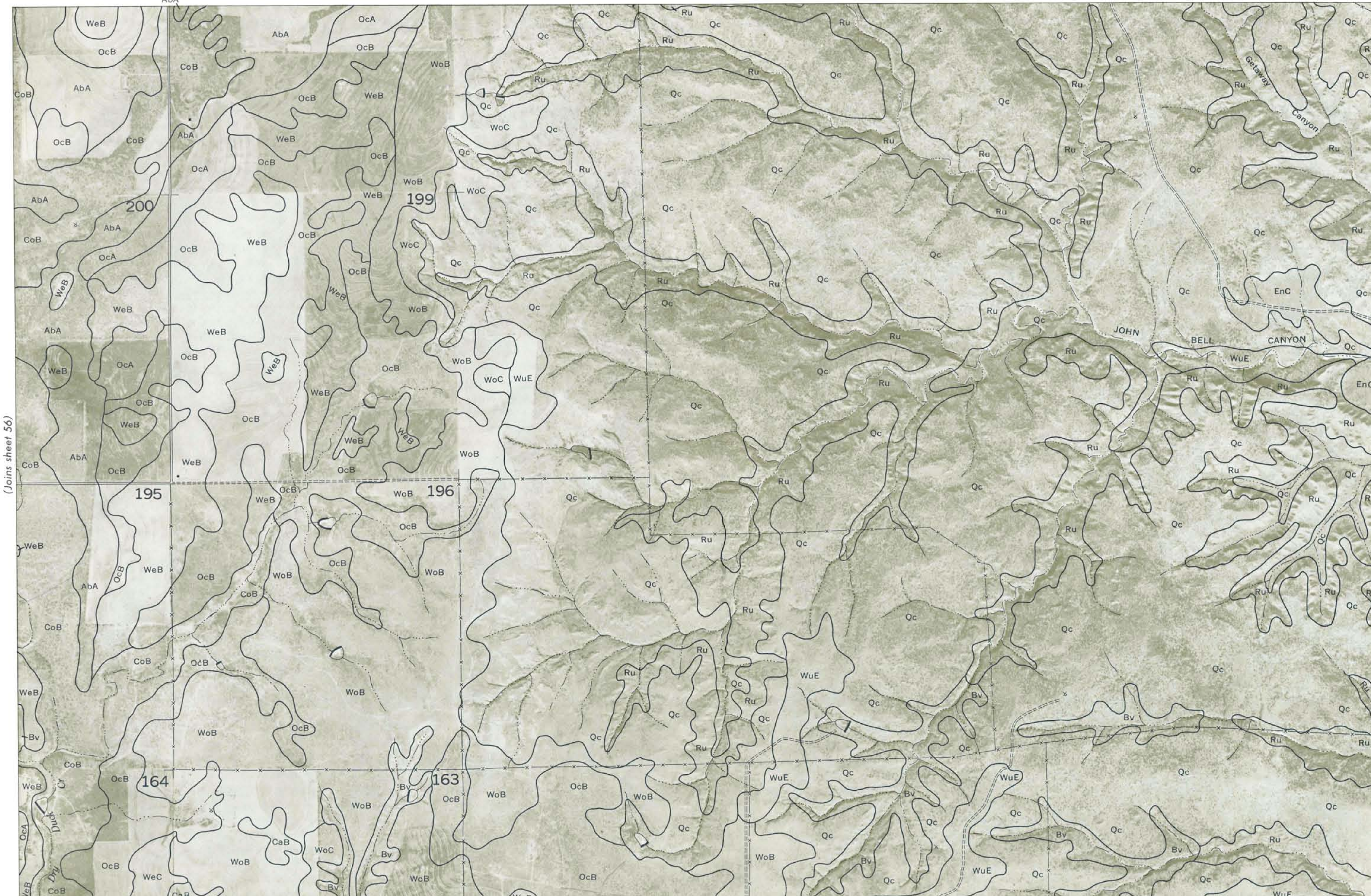
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 57

(Joins sheet 51)



(Joins sheet 64)

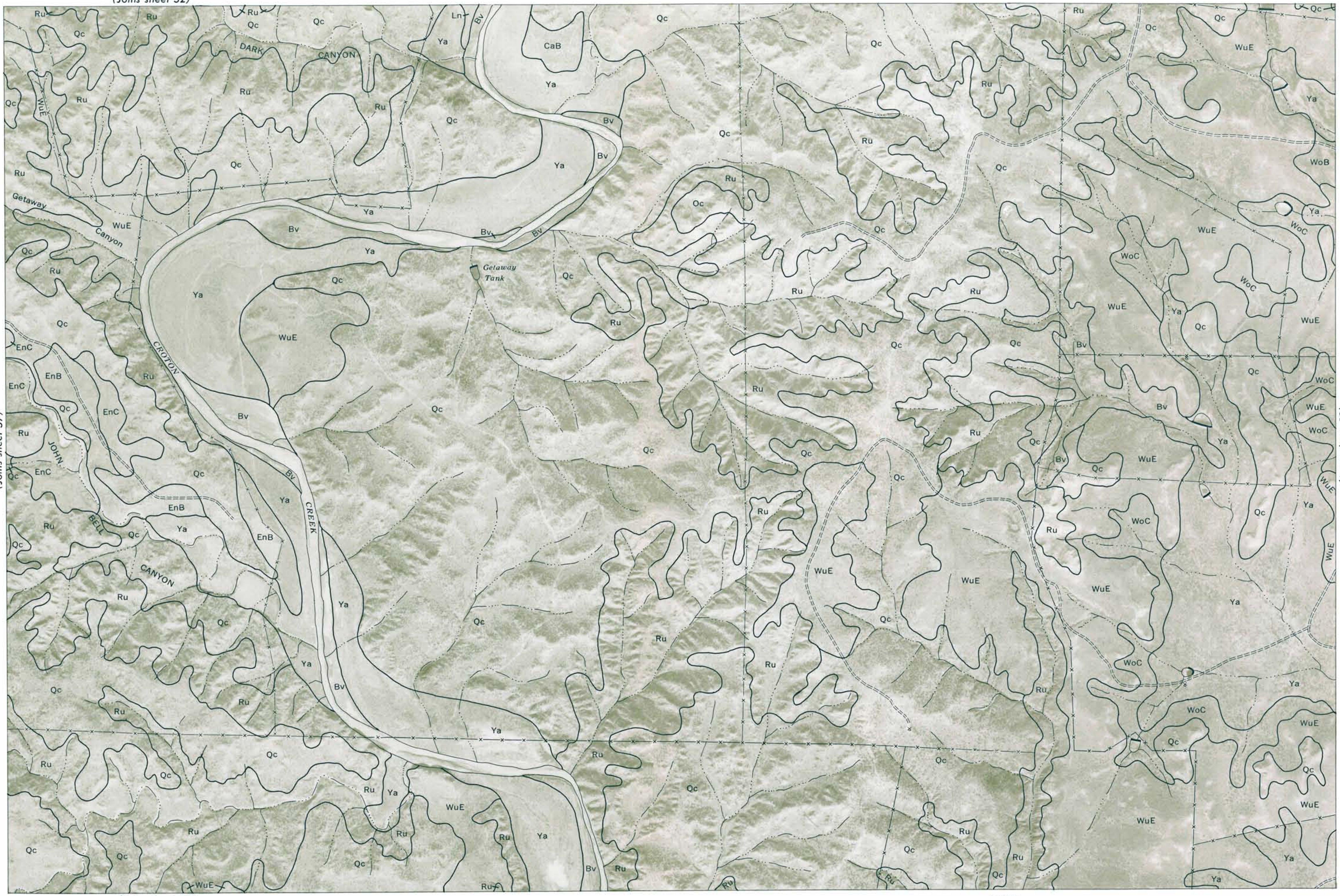
0 ½ 1 Mile

0 5000 Feet

58

(Joins sheet 52)

(Joins sheet 57)



(Joins sheet 59)

(Joins sheet 65)

0 ½ 1 Mile

0 5000 Feet

Land division corners are approximately positioned on this map.

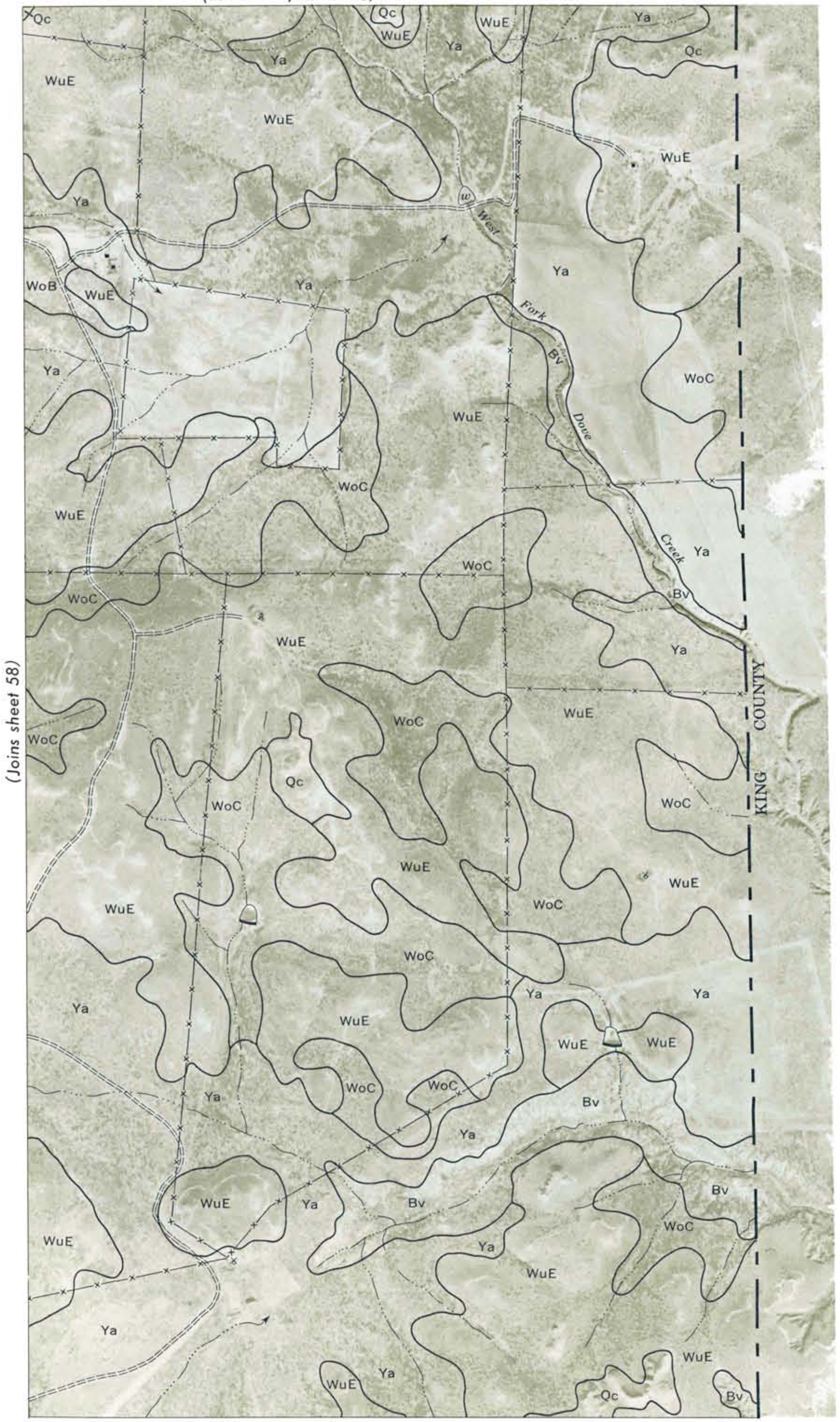
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

N

DICKENS COUNTY, TEXAS NO. 59

(Joins inset, sheet 46)

(Joins sheet 58)

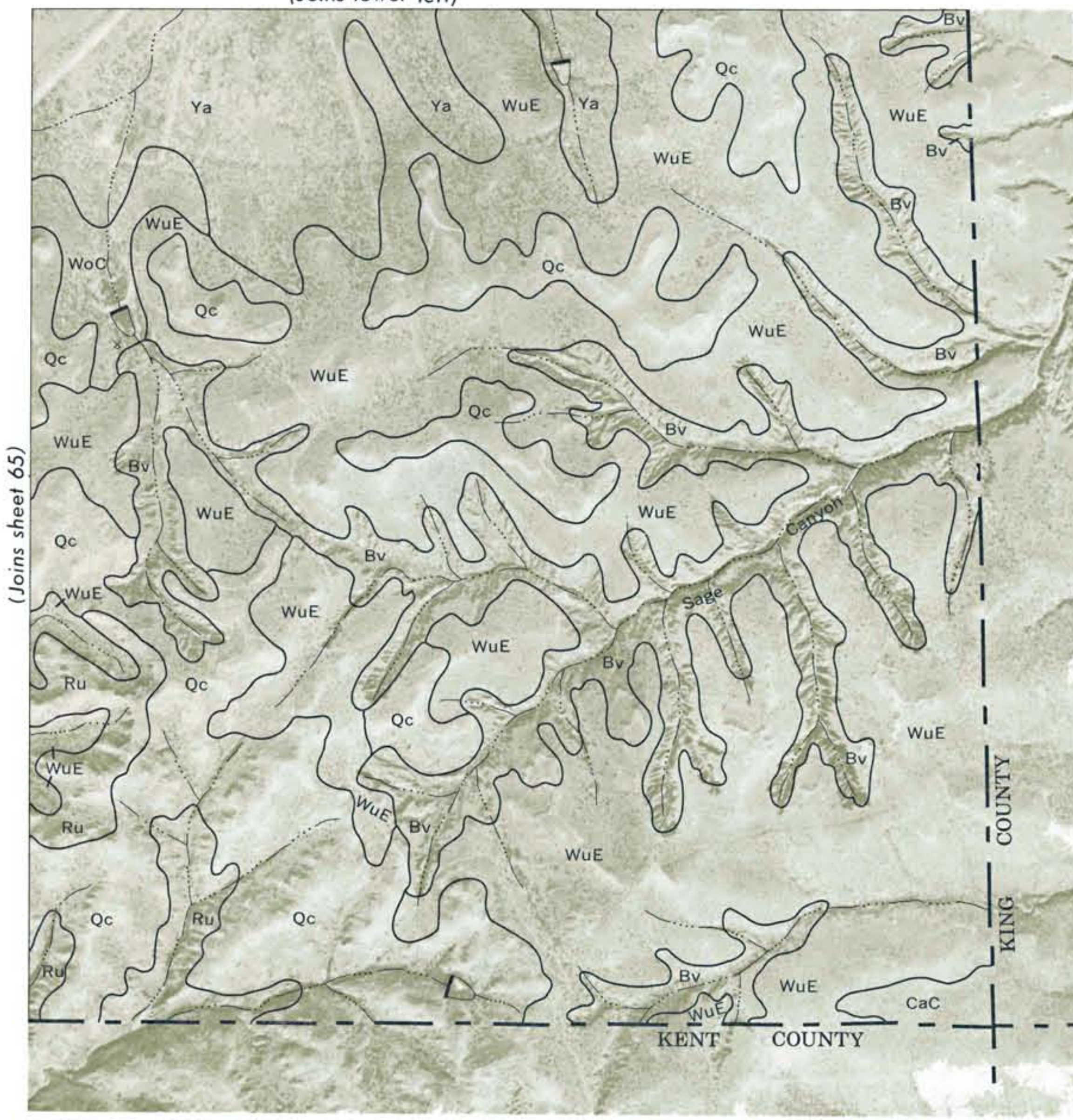


(Joins upper right)

0 ½ 1 Mile

(Joins lower left)

(Joins sheet 65)



0 5000 Feet

60

(Joins sheet 53)

(Joins sheet 61)

0 ½ 1 Mile

0 5000 Feet

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1958 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 54)

61

0 ½ 1 Mile

0 5000 Feet

62

0 ½ 1 Mile

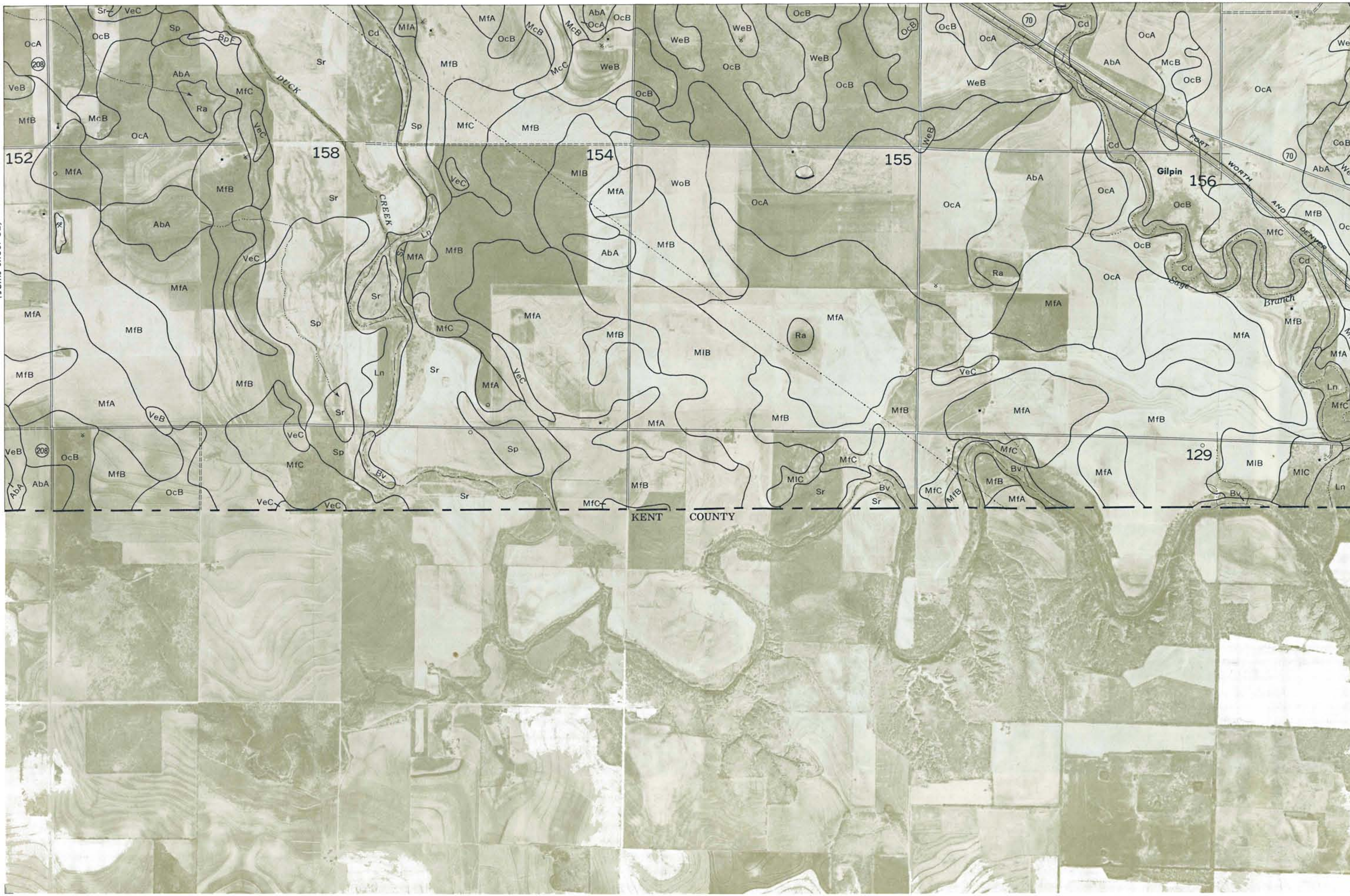
0 5000 Feet

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

DICKENS COUNTY, TEXAS — SHEET NUMBER 63

63



0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

DICKENS COUNTY, TEXAS NO. 63

64

DICKENS COUNTY, TEXAS — SHEET NUMBER 64

(Joins sheet 57)

0 ½ 1 Mile

0 5000 Feet

DICKENS COUNTY, TEXAS NO. 64

(Joins sheet 58)

65

(Joins sheet 64)

(Joins inset, sheet 59)

N

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

0 ½ 1 Mile

0 5000 Feet